THREATENED WILDLIFE OF THE UNITED STATES

1973 EDITION

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

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THREATENED WILDLIFE OF THE UNITED STATES

Compiled by

Office of Endangered Species and International Activities
Bureau of Sport Fisheries and Wildlife
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Introduction

General

This publication presents data on the status of species or subspecies of vertebrates whose existence is threatened in the United States, the District of Columbia, Virgin Islands, and the Commonwealth of Puerto Rico. Information is not yet available for American Samoa and Guam. Two previous editions of this publication, entitled Rare and Endangered Fish and Wildlife of the United States, differ from this third edition by substituting the designation, "threatened," for the designation, "rare," or "endangered," in the data pages. This change was made primarily to emphasize that the animals covered by data pages in this publication do not comprise the official list of "Endangered" species. The latter is found in the U.S. Department of the Interior's list of endangered native fish and wildlife, published in the Federal Register. As did previous editions, this edition summarizes our knowledge of the status of native vertebrates. It is intended to be a reference for compiling the official List of Endangered Native Fish and Wildlife, as a means to stimulate interest, to impart knowledge, and to solicit information about threatened wildlife. It is likely that all pertinent data are not included, and anyone who has additional information is encouraged to contact the Office of Endangered Species, Bureau of Sport Fisheries and Wildlife, see Appendix A.

Only those animals determined by the Secretary of the Interior to be threatened with extinction and named on the list which is published and amended periodically in the Federal Register, are eligible for the benefits provided by the Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa). Appendix C of this publication contains the list as of the press date of this publication.

Only threatened vertebrates are included in this publication; mollusks and crustaceans will be included in future editions. Within each of the five major Classes of vertebrates (fishes, amphibians, reptiles, birds and mammals), families, genera and species are arranged in phylogenetic order. This means that the most primitive or generalized forms are considered first, followed by increasingly more advanced or complex types within each Class. This type of arrangement is recognized by scientists throughout the world.

In addition to the Federal program for endangered native fish and wildlife, many states are adopting programs designed to prevent the extirpation of native wildlife found within their borders. Information on animals considered endangered within the states may be obtained, where available, by writing the appropriate state conservation agencies. Addresses of those agencies are listed in Appendix B. A State-by-State listing of species endangered nationwide is also included.

Acknowledgments

This publication is the result of a great deal of cooperation and effort by many persons and agencies. Clinton H. Lostetter, Rare and Endangered Species Coordinator, Bureau of Sport Fisheries and Wildlife, Portland, Oregon, coordinated the updating of the data pages. Dr. John W. Aldrich, Staff Specialist with the Bureau of Sport Fisheries and Wildlife, assisted with the bird and mammal sheets. Dr. James A. Peters, (deceased) formerly of the Smithsonian

Institution's Division of Reptiles carried much of the burden of assembling the reptile and amphibian sections. Dr. Robert R. Miller, Curator of Fishes, Museum of Zoology, University of Michigan, Dr. Edward C. Kinney, and Mr. Stephen H. Taub of the Division of Fishery Services, Bureau of Sport Fisheries and Wildlife, were largely responsible for the section on fishes. Howard R. Leach, Wildlife Management Branch, California Department of Fish and Game, Sacramento, California, and others of that agency reviewed and constructively commented on the data pages pertaining to California. Data were gleaned from the published and unpublished work of many other scientists and agencies which are too numerous to be acknowledged individually.

Federal Acts

Perhaps more confusion exists about the kind of protection an endangered species receives than about any other aspect of the program. Neither the Endangered Species Protection Act of 1966 (80 Stat. 926) nor its amended version, the Endangered Species Conservation Act of 1969, provides a Federal prohibition against the taking or possession of native endangered fish and wildlife. Federal protection is afforded to migratory birds through the Migratory Bird Treaty Act, as amended (16 U.S.C. 703-711); to eagles through the Bald Eagle Act, as amended (16 U.S.C. 668-668d): and to marine mammals through the Marine Mammal Protection Act (P.L. 92-522). Resident wildlife such as quail and pheasants, terrestrial mammals, fishes, amphibians and reptiles may be under State jurisdiction but do not have Federal protection except as provided on some Federal lands. Under the Lacey Act, as amended (18 U.S.C. 42-44) the Federal Government can become involved if an animal (endangered or not) is taken in violation of State law, and then moved across State or international boundaries.

Formal involvement by the Federal Government in endangered species conservation began with the Endangered Species Preservation Act of 1966. That law acknowledged a national responsibility to act on behalf of native species of wildlife which were "threatened with extinction." It required the Secretary of the Interior to judge what was endangered and publish in the Federal Register lists of such animals by scientific and common name. He then was authorized to:

1. Conduct research on such animals.

2. Use limited amounts of money ($750,000 per area, $2.5 million per year for a total of $15 million) from the Land and Water Conservation Fund to acquire habitat for them.

The Endangered Species Conservation Act of 1969 was signed into law on December 5, 1969. This amendment to the 1966 Act broadened the scope of the effort to conserve endangered species. Among other things it:

1. Broadened the coverage of the Act to include all vertebrates, mollusks and crustaceans.

2. Permitted the consideration of subspecies as well as species (a subspecies is a recognizable race or variant within a species).

3. Authorized the acquisition of water as well as land for endangered species.

4. Increased the amounts available from the Land and Water Conservation Fund to $2.5 million per area and $5 million per year. The $15 million overall ceiling was retained.

5. Provided significant authority for the conservation of endangered foreign wildlife. Further details on this aspect of the program are available from the Office of Endangered Species of the Bureau of Sport Fisheries and Wildlife.

Criteria for Determining an "endangered species"

Confusion still exists among laymen and scientist alike as to what constitutes an endangered species. As noted above, the list of animals published and periodically revised in the Federal Register is the United States Government's "official" list of endangered species and identifies those animals which are eligible for Federal benefits afforded an endangered species.

The Endangered Species Conservation Act of 1969 does not set forth specific criteria for determining which species are "threatened with extinction." Instead, it directs the Secretary of the Interior to seek the council of specialists and agencies with expertise on the subject, and to rely upon their combined judgment. The wording of the Act is as follows:

> "(C) A species of native fish and wildlife shall be regarded as threatened with extinction whenever the Secretary of the Interior finds, after consultation with the affected States, that its existence is endangered because its habitat is threatened with destruction, drastic modification, or severe curtailment, or because of overexploitation, disease, predation, or because of other factors, and that its survival requires assistance. In addition to consulting with the States, the Secretary shall, from time to time, seek the advice and recommendations of interested persons and organizations, including, but not limited to, ornithologists, ichthyologists, ecologists, herpetologists, and mammalogists. He shall publish in the Federal Register the names of the species of native fish and wildlife found to be threatened with extinction in accordance with this paragraph."

Thus, actual numbers of an animal is only one criterion used to determine whether or not it is "threatened with extinction." Critically low or declining populations may be sufficient reason for determining a species or subspecies to be endangered, but some which still exist in large numbers--such as the brown pelican, the sperm whale, or the Arctic peregrine falcon--may face serious threats such as environmental degradation, over-exploitation, etc., that could bring about their extirpation in the foreseeable future. When their continued existence is in peril, they may legitimately be considered as endangered species under the Act.

The earlier versions of this publication mentioned a "Rare and Endangered Species Committee" which compiled the United States List of Endangered Native Fish and Wildlife. With the increasing concern for such animals, the Federal Government shifted its emphasis

toward a restoration program for endangered species, and the Bureau of Sport Fisheries and Wildlife's Office of Endangered Species was delegated the task of providing coordination for endangered species programs, including compilation of lists. All candidate endangered species are critically evaluated by this Office, which works in close cooperation with the States, scientists, and specialists.

Anyone who has information indicating that a vertebrate, mollusk, or crustacean may be threatened with extinction is encouraged to submit that information to the Office of Endangered Species. Usually such nominations fall into one of three general categories.

1. Species which obviously are not threatened: Many nominations of species are received which are based on emotion alone, without adequate supporting data.

2. Obvious candidates: In some instances, complete, factual data are submitted which leave no doubt that an animal is indeed "threatened with extinction." In such cases the mechanics for placing the animal on the list are immediately initiated.

3. Questionable cases: The vast majority of nominations fall into this category. Substantial information is submitted which appears to indicate that an animal may be threatened. In such cases, the information is routed to specialists for their review and comment. When reviews have been completed, a final judgment on the endangered status of the animal is made by the Office of Endangered Species. If the animal is determined to be endangered, the Secretary of the Interior is advised to propose it as an endangered species in the Federal Register. A minimum of thirty (30) days is then allowed for all interested parties to further comment on the proposal before a final decision is made to list the animal as endangered.

   The removal of an animal from the list of endangered native fish and wildlife is accomplished in essentially the same manner as an addition. The list is subject to continual review, and data which may clarify the status of any animal on the list or which may be a candidate for the list are welcomed by the Office of Endangered Species.

THE PROGRAM OF THE OFFICE OF ENDANGERED SPECIES

History of the Program

The U.S. Department of the Interior has devoted effort to the preservation of threatened species for many years through protection on National Wildlife Refuges and National Parks. Environmental protection under the Fish and Wildlife Coordination Act (16 U.S.C. 661) and Environmental Policy Act (42 U.S.C. 4321) has helped preserve habitat of endangered species as well as other wildlife. This has been insufficient for some species.

A more formal endangered species program in the Bureau of Sport Fisheries and Wildlife began in 1966 when a special research program for endangered species was begun. Centered at the Patuxent Wildlife Research Center, the program had two thrusts; to learn how to

propagate certain species in captivity and to seek, through field studies, key factors that threatened the existence of certain species. Captive propagation can be an aid in bolstering some seriously threatened wild populations.

Over 35 endangered species occur on National Wildlife Refuges at sometime during the year. Management on many of these refuges focuses on endangered species such as the whooping crane at Aransas National Wildlife Refuge. Since enactment of the Endangered Species Preservation Act of 1966 which authorized use of land and water conservation funds for the acquisition of endangered species habitat, refuge lands have been purchased specifically for endangered species.

As a result of the Endangered Species Conservation Act of 1969, a list of foreign endangered species was developed and importation controls for such species were emphasized. Agents were added to the staff of the Bureau's Division of Law Enforcement to inspect shipments of wildlife arriving at ports of importation.

In Fiscal Year 1973, new emphasis was placed on endangered species. New funds were appropriated for management of endangered species and efforts were initiated to draw attention and provide input by outside sources. The professional staff of the Office of Endangered Species and International Activities was increased from 2 to 8. A new species by species approach to management was adopted.

Recovery plan concept

The needs of many endangered species are greater than any one agency or level of government can supply. Broad public support of the program is required. States are intimately involved because of the habitat they control, the legal responsibilities they have for resident wildlife, and biological skills possessed by professional ecologists they employ. Most Federal agencies have contributions to make, particularly land managing agencies such as the Forest Service, Bureau of Land Management, Bureau of Sport Fisheries and Wildlife, National Park Service, and military installations under the Department of Defense. Also involved are agencies charged with the protection of environments such as the President's Council on Environmental Quality, Environmental Protection Agency, Bureau of Outdoor Recreation, Department of Health, Education and Welfare, or those affecting the environment such as the Corps of Engineers, Bureau of Reclamation, Tennessee Valley Authority, and Atomic Energy Commission. A successful endangered species program must be coordinated among all such agencies at all levels of government. Private organizations and groups serve not only to provide leadership but also to supply expertise and funding for various projects.

The guide for coordination of activities pertaining to endangered species among these agencies will become the recovery plan. Such a plan will identify restoration problems for each species and will detail step by step solutions. Also, the plan will show the order in which actions are to be undertaken and who is assigned to carry them out. In this manner, roles to be played by various State and Federal agencies and private groups can be specifically identified. Costs to accomplish various objectives will be estimated. The recovery plan will demonstrate the perspective involved for each action proposed. Plans will also serve to identify the most urgently needed research needs. Their ultimate purpose is to encourage participation by all organizations that can play a part in the survival of the

species. The first plans are now being developed with the cooperation of agencies and individuals that have expertise or a key role in the recovery of a given species.

Species and subspecies priorities

A priority system is being developed for determining which species should receive necessary shares of the program's limited resources. It is not likely that sufficient resources in manpower and funds for all needs of all species will be immediately available. Adding species to the endangered species list and development of recovery plans for them will help provide protection of existing habitats regardless of the priority of that species. But where more manpower and funds are needed, priorities will come into play to help assure that resources expended by various agencies and groups are sufficiently concentrated species-wise to assure desired results.

CONTENTS

Page

THREATENED WILDLIFE OF THE UNITED STATES

Introduction iii
General iii
Acknowledgements iii
Federal Acts iv
Criteria for determining an "endangered species" .. v
The Program of the Office of Endangered Species vi
History of the program vi
Recovery plan concept vii
Species and subspecies priorities viii

EXTINCT OR PRESUMED-EXTINCT WILDLIFE 1
Fishes 1
Birds 1
Mammals 4

THREATENED FISHES OF THE UNITED STATES 5
Shortnose sturgeon 6
Lake sturgeon 7
Longjaw cisco 9
Deepwater cisco 11
Blackfin cisco 12
Arctic grayling 14
Lahontan cutthroat trout 16
Paiute cutthroat trout 18
Greenback cutthroat trout 19
Rio Grande cutthroat trout 20
Humboldt cutthroat trout 21
Little Kern golden trout 22
Gila trout 23
Arizona (Apache) trout 24
Sunapee trout 25
Blueback trout 26
Olympic mudminnow 27
Desert dace 28
Humpback chub 29
Pahranagat bonytail 30
Mohave chub 31
Little Colorado spinedace 32
Moapa dace 33
Woundfin 34
Colorado squawfish 35
Kendall Warm Springs dace 36

THREATENED FISHES OF THE UNITED STATES--continued

White River (Mountain) sucker..... 37
Modoc sucker..... 38
Cui-ui..... 39
Ozark cavefish..... 40
Devil's Hole pupfish..... 41
Comanche Springs pupfish..... 42
Tecopa pupfish..... 43
Nevada pupfish..... 44
Warm Springs pupfish..... 45
Owens pupfish..... 46
Pahrump killifish..... 47
Big Bend gambusia..... 48
Clear Creek gambusia..... 49
Pecos gambusia..... 50
San Marcos gambusia..... 51
Gila topminnow..... 52
Unarmored threespine stickleback..... 53
Roanoke bass..... 54
Suwannee bass..... 56
Sharphead darter..... 57
Fountain darter..... 58
Niangua darter..... 59
Watercress darter..... 60
Okaloosa darter..... 61
Maryland darter..... 63
Trispot darter..... 64
Tuscumbia darter..... 65
Blue pike..... 66
Pygmy sculpin..... 68
Peripheral fishes..... 69
Status-undetermined fishes..... 70
THREATENED REPTILES AND AMPHIBIANS OF THE UNITED STATES.... 73
Santa Cruz long-toed salamander..... 74
Desert slender salamander..... 75
Tehachapi slender salamander..... 76
Limestone salamander..... 77
Shasta salamander..... 78
Jemez Mountain salamander..... 80
Texas blind salamander..... 81
Black toad, Inyo County toad..... 82
Vegas Valley Leopard frog..... 84
Houston toad..... 85
Pine Barrens tree frog..... 86
American crocodile..... 87
American alligator..... 88

Bog turtle..... 90
Green turtle..... 91
St. Croix ground lizard..... 93
Blunt-nosed leopard lizard..... 94
Puerto Rican boa (Culebra Grande)..... 96
San Francisco garter snake..... 97
Status-undetermined reptiles and amphibians..... 98
THREATENED BIRDS OF THE UNITED STATES..... 99
Newell's Manx shearwater..... 100
Hawaiian dark-rumped petrel (uau)..... 101
Eastern brown pelican..... 102
California brown pelican..... 104
Florida great white heron..... 106
Hawaiian goose (nene)..... 108
Aleutian Canada goose..... 109
Tule white-fronted goose..... 111
Laysan duck..... 113
Hawaiian duck (koloa)..... 114
Mexican duck..... 116
California condor..... 118
Florida Everglade kite (Florida snail kite)..... 120
Puerto Rican sharp-shinned hawk..... 122
Hawaiian hawk (io)..... 123
Southern bald eagle..... 124
Prairie falcon..... 126
American peregrine falcon..... 127
Arctic peregrine falcon..... 129
Northern greater prairie chicken..... 131
Attwater's greater prairie chicken..... 133
Lesser prairie chicken..... 134
Masked bobwhite..... 136
Whooping crane..... 138
Florida sandhill crane..... 140
Mississippi sandhill crane..... 141
California clapper rail..... 142
Light-footed clapper rail..... 144
Yuma clapper rail..... 145
California black rail..... 146
Hawaiian gallinule (alae ula)..... 147
Hawaiian coot (alae keokeo)..... 148
Eskimo curlew..... 149
Hawaiian stilt (aeo)..... 151

California least tern..... 153
Puerto Rican plain pigeon..... 155
Puerto Rican parrot..... 156
Newton's Puerto Rican screech owl..... 158
Spotted owl..... 159
Puerto Rican whip-poor-will..... 161
Red-cockaded woodpecker..... 162
American ivory-billed woodpecker..... 164
Hawaiian crow (alala)..... 166
Small Kauai thrush (puaiohi)..... 167
Large Kauai thrush (Kauai omao)..... 168
Molokai thrush (olomau)..... 170
Nihoa millerbird..... 171
Kauai oo (oo aa)..... 172
Bachman's warbler..... 173
Golden-cheeked warbler..... 174
Kirtland's warbler..... 175
Elfin Woods warbler..... 177
Crested honeycreeper (akohekohe)..... 178
Kauai akialoa..... 179
Kauai nukupuu..... 180
Maui nukupuu..... 181
Akiapolaau..... 183
Hawaii akepa (akepa)..... 184
Maui akepa (akepuie)..... 185
Oahu creeper (alauwahio)..... 186
Molokai creeper (kakawahie)..... 187
Maui parrotbill..... 188
Ou..... 189
Laysan finch..... 190
Nihoa finch..... 191
Palila..... 192
Wallowa gray-crowned rosy finch..... 193
Ipswich sparrow..... 194
Dusky seaside sparrow..... 195
Cape Sable sparrow..... 197
Peripheral birds..... 198
Status-undetermined birds..... 203
THREATENED MAMMALS OF THE UNITED STATES..... 207
General references - mammals..... 208
Indiana bat..... 209
Ozark big-eared bat..... 211
Virginia big-eared bat..... 212
Hawaiian hoary bat..... 214
Spotted bat..... 215
Utah prairie dog..... 217
Kaibab squirrel..... 218

Delmarva Peninsula (Bryant) fox squirrel..... 220
Everglades fox squirrel..... 222
Morro Bay kangaroo rat..... 224
Salt-Marsh harvest mouse..... 226
Key Largo wood rat..... 228
Block Island meadow vole..... 230
Beach meadow vole..... 231
Whales..... 232
Sperm whale or Cachalot..... 232
Gray whale..... 232
Blue whale..... 233
Finback whale..... 233
Sei whale..... 233
Humpback whale..... 233
Right whale..... 233
Bowhead whale..... 234
Northern Rocky Mountain wolf..... 235
Eastern timber wolf..... 237
Mexican wolf..... 239
Red wolf..... 241
San Joaquin kit fox..... 243
Glacier bear..... 244
Grizzly bear..... 245
Black-footed ferret..... 247
Southern sea otter..... 249
Florida panther..... 251
Eastern cougar..... 253
Ribbon seal..... 255
Caribbean monk seal..... 256
Hawaiian monk seal..... 257
Guadalupe fur seal..... 259
Florida manatee or Florida sea cow..... 261
Tule elk or Dwarf elk..... 263
Key deer..... 265
Columbian white-tailed deer..... 266
Sonoran pronghorn..... 267
California bighorn..... 268
Peninsular bighorn..... 270
Peripheral mammals..... 272
Status-undetermined mammals..... 273

APPENDIXES
A. Addresses, Office of Endangered Species and Regional Offices..... 275
B. State Conservation Agency addresses; State-by-State listing of endangered species..... 278
C. Nationwide list of endangered species..... 287

EXTINCT OR PRESUMED EXTINCT WILDLIFE

EXTINCT FISHES

San Gorgonio Trout, Salmo evermanni. Santa Ana River in California. Extinct about 1935.

Pahranagat Spinedace, Lepidomeda altivelis. Outflow of Ash Spring and chain of lakes in the Pahranagat Valley in Nevada. Extinct between 1938 and 1959.

Big Spring Spinedace, Lepidomeda mollispinis pratensis. Spring-fed marsh, Lincoln County, Nevada. Extinct between 1938 and 1959.

Harelip Sucker, Lagochila lacera. Found in a few clear streams of the upper Mississippi Valley; Scioto River in Ohio, Tennessee River in Georgia, and the White River in Arkansas; also in the Lake Erie drainage, Blanchard and Auglaize Rivers in northwestern Ohio. Not seen since 1900.

Leon Springs Pupfish, Cyprinodon bovinus. Leon Springs, Pecos County, Texas. Not seen since 1938.

Ash Meadows Springfish, Empetrichthys merriami. Isolated waters of Death Valley in southern Nevada. Not seen since 1942.

EXTINCT BIRDS

Labrador Duck, Camptorhynchus labradorium. Northeastern North America. Extinct about 1875. Reason unknown.

Heath Hen, Tympanuchus cupido cupido. Eastern United States. Extinct in 1932. Reasons--overhunting and loss of habitat.

Laysan Rail, Porzanula palmeri. Laysan Island, Hawaii. Extinct on Laysan Island in 1926. Extinct in 1944 on Eastern Island, Midway Atoll where transplanted previously from Laysan. Reasons--loss of habitat (rabbits eating vegetation): predation by rats on Midway.

Sandwich Rail (Moho), Pennula sandwichensis. Hawaii Island, Hawaii. Extinct about 1893. Reasons--probably predation by introduced rats and mongooses.

Great Auk, Pinguinus impennis. North Atlantic Ocean. Extinct about 1844. Reason--overhunting.

Passenger Pigeon, Ectopistes migratorius. North American. Extinct in 1914. Reasons--overhunting and loss of habitat.

Culebra Puerto Rican Parrot, Amazona vitata gracilipes. Culebra Island, Puerto Rico. Extinct about 1899. Reason--unknown.

Mauge's Parakeet, Aratinga chloroptera maugei. Puerto Rico. Extinct about 1892. Reason--destruction of forest habitat.

Carolina Parakeet, Conuropsis carolinensis carolinensis. Southeastern United States. Extinct about 1920. Reasons--overhunting and loss of forest habitat.

Louisiana Parakeet, Conuropsis carolinensis ludoviciana. South central United States. Extinct about 1912. Reasons--overhunting and loss of forest habitat.

Oahu Thrush, Phaeornis obscurus oahensis. Oahu Island, Hawaii. Extinct after 1825. Reasons--alteration of environment by modern man, probably avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats and cats hypothetical.

Lanai Thrush, Phaeornis obscurus lanaiensis. Lanai Island, Hawaii. Extinct in 1931. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Molokai Thrush, Phaeornis obscurus rutha. Molokai Island, Hawaii. Extinct in 1936. Reasons--alteration of environment by modern man, probable avain disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Laysan Millerbird, Acrocephalus familiaris familiaris. Laysan Island, Hawaii. Extinct between 1904 and 1923. Reason--loss of habitat due to introduced rabbits eating vegetation.

Kioea, Chaetoptila angustipluma. Hawaii Island, Hawaii. Extinct after 1859. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats and cats hypothetical.

Oahu Oo, Moho apicalis. Oahu Island, Hawaii. Extinct about 1837. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes, killing by native plume hunters. Predation by introduced rats and cats hypothetical.

Molokai Oo, Moho bishopi. Molokai Island, Hawaii. Extinct in 1915. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes, killing by native plume hunters. Predation by introduced rats, cats, and mongooses hypothetical.

Hawaii Oo, Moho nobilis. Hawaii Island, Hawaii. Extinct in 1934. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes, killing by native plume hunters. Predation by introduced rats, cats, and mongooses hypothetical.

Laysan Apapane, Himatione sanguinea freethii. Laysan Island, Hawaii. Extinct soon after 1923. Reason--destruction of the vegetation by introduced rabbits.

Hawaii Mamo, Drepanis pacifica. Hawaii Island, Hawaii. Extinct about 1898. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes, killing by native plume hunters. Predation by introduced rats, cats, and mongooses hypothetical.

Perkins' Mamo or Black Mamo, Drepanis funerea. Molakai Island, Hawaii. Extinct about 1907. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Oahu Akialoa, Hemignathus obscurus lichtensteinii. Oahu Island, Hawaii. Extinct after 1837. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats and cats hypothetical.

Lanai Akialoa, Hemignathus obscurus lanaiensis. Lanai Island, Hawaii. Extinct about 1894. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Hawaii Akialoa, Hemignathus obscurus obscurus. Hawaii Island, Hawaii. Extinct in 1895. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Oahu Nukupuu, Hemignathus lucidus lucidus. Oahu Island, Hawaii. Extinct about 1860. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats and cats hypothetical.

Oahu Akepa, Loxops coccinea rufa. Oahu Island, Hawaii. Extinct 1895. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Greater Amakihi (Green Solitaire), Loxops sagittirostris. Hawaii Island, Hawaii. Extinct in 1900. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Lanai Alauwahio, Loxops maculata montana. Lanai Island, Hawaii. Extinct in 1937. Reason--destruction of habitat.

Ula-ai-hawane, Ciridops anna. Hawaii Island, Hawaii. Extinct about 1892. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Greater Koafinch (Hopue), Psittirostra palmeri. Hawaii Island, Hawaii. Extinct about 1896. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Lesser or Yellow-headed Koafinch, Psittirostra flaviceps. Hawaii Island, Hawaii. Extinct about 1891. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

Grosbeakfinch or Konafinch, Psittirostra kona. Hawaii Island, Hawaii. Extinct in 1894. Reasons--alteration of environment by modern man, probable avian disease from introduced birds and spread by introduced mosquitoes. Predation by introduced rats, cats, and mongooses hypothetical.

EXTINCT MAMMALS

Gull Island Vole, Microtus nesophilus. Gull Island, Long Island Sound, New York. Extinct in 1898.

Amargosa Meadow Vole, Microtus californicus scirpensis. California. Extinct in 1917.

Plains Wolf, Canis lupus nubilus. Great Plains. Extinct in 1926.

Sea Mink, Mustela macrodon. New England coast. Extinct in 1890.

Eastern Cougar, Felis concolor couguar. Eastern United States. Regarded as extirpated in U.S. in 1899; may be reestablished from Canadian relicts.

Steller's Sea Cow, Hydrodamalis stelleri. North Pacific, Bering Sea. Extinct in 1768.

Eastern Elk, Cervus canadensis canadensis. United States east of Great Plains. Extinct in 1880.

Merriam Elk, Cervus merriami. Arizona. Extinct in 1900.

Badlands Bighorn, Ovis canadensis auduboni. North and South Dakota. Extinct in 1910.

Threatened

FISHES

of the United States

Species or subspecies of fishes that are so few in numbers or so threatened by present circumstances, as to be in danger of extinction.

Arranged, one sheet for each species or subspecies, taxonomically by families and alphabetically by genera and species from "A List of Common and Scientific Names of Fishes from the United States," American Fisheries Society Special Publication No. 6, September 1970.

SHORTNOSE STURGEON — Acipenser brevirostrum (Lesueur, 1818)

Order: ACIPENSERIFORMES — Family: ACIPENSERIDAE

Distinguishing characteristics: A small species of sturgeon (seldom exceeding three feet in length), mouth wide (its width over 62 percent of interorbital width), viscera blackish, adults with short snout, scutes prominent, one row of preanal scutes.

Present distribution: All recent U.S. records are from the Hudson River except one Florida specimen.

Former distribution: Atlantic seaboard rivers from New Brunswick to Florida, including the Hudson, Delaware, Potomac, Connecticut, Salmon Creek (North Carolina) and St. Johns River watershed (Florida). There have been a few records in salt water (New Jersey).

Status: In peril. The species is gone in most of the rivers of its former range. Is probably not as yet extinct.

Estimated numbers: There are no recent records.

Fecundity: The spawning habits have not been well studied. In the Hudson River spawning fish have been taken in late April.

Reasons for decline: Pollution is probably the major factor. Overfishing has also been likely since this species has been intensively fished on spawning areas, also has been taken in shad gill nets over a wide area of the Hudson and other rivers.

Protective measures already taken: Other than some routine regulations such as 20-inch size limit, no protective measures seem to have been taken.

Measures proposed: A survey of the current status of the species would be basic to the development of a plan. Locating the spawning areas would be a key point to the development of effective protection.

Number in captivity: No data, probably none.

Culture potential in captivity: Probably not possible to culture in captivity. It might be possible to propagate from fertilized eggs obtained from wild specimens.

Remarks: Data submitted by the New York Conservation Department, Division of Fish and Game.

References:

Jordan, D.S. and B. W. Evermann. 1902. American food and game fish. Doubleday, Page & Co., N.Y., 572.

Vladykov, V. D. and J. R. Greeley. Order Acipenseroidei in fishes of the western north Atlantic, Memoir Sears Foundation for Marine Research I(3), 1963: 24-60.

LAKE STURGEON — Acipenser fulvescens (Rafinesque, 1817)

Order: ACIPENSERIFORMES — Family: ACIPENSERIDAE

Significance: Once a very abundant species in the shallow waters of the Great Lakes. Records are incomplete but a commercial catch of over 8.5 million pounds was recorded in 1885. It is rare in either commercial or sport fisheries in recent years.

Distinguishing characteristic: Largest fish of the Great Lakes, sometimes exceeding 7 feet and 300 pounds. The sturgeon is sometimes called a living fossil as they are still much like their ancestors of the upper Cretaceous period that were abundant over 100 million years ago.

Present distribution: Throughout most of its former range in greatly reduced numbers.

Former distribution: Once abundant in the Great Lake drainage; in the Red River, Saskatchewan River and southern Hudson Bay tributaries of Canada; and west of the Appalachian Mountains to the Tennessee River of Alabama, to Missouri, to eastern Nebraska, to northern Kansas.

Status: Very uncommon.

Estimated numbers: U.S. Annual catch from Great Lakes varies from 1,000 to 3,000 pounds.

Fecundity: Sturgeon spawn in shallow waters of lakes and streams. The number of eggs varies greatly with the size of the fish--egg counts range from 49,835 to 667,472 for fish from 11 to 112 pounds, respectively. Sturgeon reach maturity at about 20 years and females do not spawn every year.

Reasons for decline: Although early fishermen took large numbers of sturgeon for sale, great numbers were also caught and destroyed because they damaged gear fished for other species. They were easy to catch, and as a consequence of their slow growth and late maturity they were reduced to insignificance.

Protective measures already taken: Lake sturgeon are completely protected in some areas and partly protected in others by size limits that permit them to reach maturity. Their numbers seem to have increased under protection.

Measures proposed: The protection of lake sturgeon should be reviewed periodically to make certain that it is adequate in various sections of its range, and should be uniform in the same waters where more than one regulatory agency is involved.

Number in captivity: No data.

Culture potential in captivity: Have been hatched and raised for a short period in hatcheries.

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan.

References:

Harkness, W. J. K. and J. R. Dymond. 1961. The lake sturgeon. Ontario Dept. of Lands and Forests, Fish and Wildlife Branch. Toronto. 121 p.

Jordan, D.S. and B. W. Evermann. 1902. American food and game fishes. Doubleday, Page & Co., N.Y., 572 p.

LONGJAW CISCO — Coregonus alpenae (Koelz, 1924)

Order: SALMONIFORMES — Family: SALMONIDAE

Significance: A major constituent of the commercial chub catch of Lakes Michigan and Huron until the 1950's.

Distinguishing characteristics: Although on an average it is a medium size cisco, some grew to very large size (15 inches and 2 pounds) equal to the largest ciscoes of the Great Lakes. It is distinguished from other ciscoes by its pale color, relatively short fins, and intermediate number of gill rakers.

Present distribution: Greatly reduced numbers throughout Lakes Michigan and Huron, and a very small population in the small deep hole in eastern Lake Erie that was still present as late as 1948.

Former distribution: Very abundant throughout the deeper areas of Lakes Michigan and Huron, but most common at intermediate depths (20 to 60 fathoms).

Status: Seriously depleted. Only seven have been taken during intensive studies of southern Lake Michigan in 1962-64.

Estimated numbers: No data.

Fecundity: Spawn in moderately deep areas in late November.

Reasons for decline: Recent decline has resulted from sea lamprey predation and intensive commercial fishery for large ciscoes, and increased competition from the small bloater (Coregonus hoyi) and alewife (Alosa pseudoharengus) in Lakes Michigan and Huron. The low number in Lake Erie is due to very limited favorable environment which has become increasingly unfavorable in recent years.

Protective measures already taken: None.

Measures proposed: The species might be preserved by collecting eggs from spawning fish (if they can be found) and planting the young in remote, deepwater lakes.

Number in captivity: None.

Culture potential in captivity: Ciscoes are very delicate and difficult to rear in captivity but they have not reproduced in captivity.

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan.

References:

Hile, R. and H. J. Buettner. 1955. Commercial fishery for chubs (ciscoes) in Lake Michigan through 1953. U.S. Fish and Wildlife Serv., Spec. Sci.

Rept.--Fish. (163):49.
Koelz, W. 1929. Coregonid fishes of the Great Lakes. Bull. U.S. Bur. Fish., 43, 1927:297-643.
Scott, W. B. and S. H. Smith. 1962. The occurrence of the longjaw cisco, Leucichthys alpenae, in Lake Erie. J. Fish. Res. Bd. Canada, 19(6):1013-1023.
Smith, S. H. 1964. Status of the deepwater cisco population of Lake Michigan. Trans. Am. Fish. Soc., 93(2):155-163.

DEEPWATER CISCO — Coregonus johannae (Wagner, 1910)

Order: SALMONIFORMES — Family: SALMONIDAE

Significance: The deepwater cisco is one of the two most important species in the early chub fishery of the Great Lakes.

Distinguishing characteristics: Second largest of the ciscoes of the Great Lakes distinguished by its very pale coloration and fewer gill rakers than other ciscoes.

Present distribution: Unknown if extant.

Former distribution: Once abundant in deeper waters of Lakes Michigan and Huron.

Status: At least seriously depleted, although probably extinct.

Estimated numbers: Last specimen reported in Lake Michigan in 1951. None seen subsequently in fishery surveys of Lakes Michigan and Huron.

Fecundity: Spawned in deeper waters in late summer.

Reasons for decline: The decline in the early 1900's was probably due to intensive commercial fishery. Recent decline and disappearance due to sea lamprey predation and continued heavy fishing for larger ciscoes during the 1940's and 1950's.

Protective measures already taken: None.

Measures proposed: If a relict stock is found, they might be transferred to a remote lake.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan. Dr. Stanford Smith, BCF, in his letter of July 31, 1967, said, "The last record of a deepwater cisco was in 1951." Dr. R. R. Miller reported on October 3, 1968, that the deepwater cisco is extinct.

References:

Hile, R. and H. J. Buettner. 1955. Commercial fishery for chubs (ciscoes) in Lake Michigan through 1953. U.S. Fish and Wildlife Serv., Spec. Sci. Rept.--Fish. (163): 49.

Koelz, W. 1929. Coregonid fishes of the Great Lakes, Bull. U.S. Bur. Fish. 43, 1927: 297-643.

Smith, S. H. 1964. Status of the deepwater cisco population of Lake Michigan. Trans. Am. Fish. Soc., 93(2):155-163.

BLACKFIN CISCO — Coregonus n. nigripinnis (Gill, 1872)

Order: SALMONIFORMES — Family: SALMONIDAE

Significance: The blackfin cisco is the largest cisco of the Great Lakes, and was a very important commercial species in the early fishery.

Distinguishing characteristics: Distinguished by its large size and deep body, the very dark coloration of the fins and back, and high number of gill rakers.

Present distribution: Unknown if extant in Lakes Michigan and Huron, the only lakes where the typical blackfin cisco was found. Subspecies of uncertain relationship under present taxonomic concepts have been reported from Lake Ontario (C. n. prognathus, considered since the early 1900's) and Lakes Superior (C. n. cyanopterus) and Nipigon (C. n. prognathus) in greatly reduced numbers. The blackfin cisco has been reported from lakes of Ontario, Manitoba, and Saskatchewan, but their relation to the blackfin of the Great Lakes is uncertain.

Former distribution: The typical blackfin (C. n. nigripinnis) was only found in the deepest waters of Lakes Michigan and Huron.

Status: At least seriously depleted, although probably extinct. Last specimen taken in Lake Michigan in 1955. None seen subsequently in fishery surveys of Lakes Michigan and Huron.

Estimated numbers: Unknown.

Fecundity: Believed to have spawned in deeper waters in midwinter. Matured at a greater age and size than other ciscoes.

Reasons for decline: The decline in the early 1900's was probably due to intensive commercial fishery. Present decline and disappearance due to sea lamprey predation and continued heavy fishing for larger ciscoes during the 1940's and 1950's.

Protective measures already taken: None.

Measures proposed: If a relict stock is found, they might be transferred to a remote lake.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan. Dr. Stanford Smith has stated that "....the last record of the blackfin cisco was in 1955."

References:

Hile, R. and H. J. Buettner. 1955. Commercial fishery for chubs (ciscoes) in Lake Michigan through 1953. U.S. Fish and Wildlife Serv., Spec. Sci. Rept.--Fish. (163):49.

Koelz, W. 1929. Coregonid fishes of the Great Lakes. Bull. U.S. Bur. Fish. 43, 1927:297-643.

Scott, W. B. 1960. Summaries of research information on shortjaw cisco, shortnose cisco, and blackfin cisco. Research Branch, Ont. Dept. Lands and Forest. Research Information Paper (Fisheries) (9): 24.

Smith, S. H. 1964. Status of the deepwater cisco population of Lake Michigan. Trans. Am. Fish. Soc., 93 (2):155-163.

ARCTIC GRAYLING — Thymallus arcticus (Pallas, 1776)

Order: SALMONIFORMES — Family: SALMONIDAE

The grayling, now considered one species, was formerly in a separate family, the THYMALLIDAE, and contained three species:

Thymallus signifer Richardson, 1823, Arctic grayling
Thymallus tricolor Cope, 1865, Michigan grayling (extinct)
Thymallus montanus Milner, 1874, Montana grayling

The Arctic grayling is neither rare nor endangered in Alaska

The paper is primarily concerned with the Montana form of the grayling and the following remarks apply to the Montana form.

Distinguishing characteristics: Huge dorsal fin, particularly in the spawning male, which is bluish-green with bright pink or red spots. The back is olive, shading into a light purple on the sides and a bluish-white on the belly. Sides of body above pectorals with irregular black spots. With adipose fin and large scales. Usual weight in Montana is less than a pound.

Present distribution: Relict and transplanted populations exist in 20 lakes and 25 streams in Montana, however substantial populations occur in only a few of these; 20 lakes in Utah; 3 lakes in Wyoming; 2 lakes in Washington, 1 lake in Colorado; and in Glacier and Yellowstone National Parks.

Former distribution: The Arctic grayling was common in the Missouri River drainage above Great Falls, mostly in Montana. The Michigan form was found in the upper part of the Lower Peninsula of Michigan and the Otter River drainage in the Upper Peninsula.

Status: Very uncommon.

Estimated numbers: No data.

Fecundity: Grebe Lake, Yellowstone National Park--average 1,650 eggs per adult female; Rogers Lake, Montana--range 1,000 to 15,000 eggs per female; averages 5,828 eggs per female, 750-840 eggs per ounce and 2,737 eggs per female, 627 eggs per ounce.

Reasons for decline: Change of habitat resulting from timber removal; surface mining and overgrazing; streams became warmer, gravel spawning areas became covered with silt and sand. Beaver dams block spawning migrations. Water of some streams is used for irrigation. Competition from other species, including brook trout, rainbow trout, and suckers.

Protective measures already taken: Limited fishing permitted in grayling habitat on Red Rock Lakes National Wildlife Refuge. A counting weir was installed on Red Rock Creek. Length of fishing season was reduced in other Montana waters. Hatchery production varies considerably at State and National fish hatcheries. About a million fry, 10,000-20,000 fingerlings and 10,000-30,000 six-inch fish are reared annually.

Measures proposed: Protection of natural stream channels and bank cover; (Montana), reduction in erosion from surface mining, grazing lands and roads; control of beaver and removal of dams on spawning streams; control of water use for irrigation and screening of irrigation diversion ditches; and experimental stocking in barren mountain lakes. This species has been widely stocked with only very limited success.

Number in captivity: Not known.

Culture potential in captivity: Usually eggs and milt are taken from wild stock.

Remarks: None.

References:

Brown, C. J. D. 1938. Observations on the life-history and breeding habits of the Montana grayling. Copeia, p. 132-136.

Kruse, T. E. 1959. Grayling of Grebe Lake, Yellowstone National Park, U.S. Fish & Wildlife Serv. Fishery Bull. 149.

Milner, J. W. 1874. Notes on the grayling of North America Report of the Commissioner for 1872 and 1873, U.S. Commission of Fish and Fisheries p. 729-742.

Nelson, P. H. 1954. Life history and management of the American grayling (Thymallus signifer tricolor) in Montana. Jour. of Wild. Mgt., Vol. 18, p. 324-342.

Smith, H. M and W. C. Kendall. 1921. Fishes of Yellowstone National Park, U.S. Bureau of Fisheries Document No. 904, 30 pp.

Vincent, R. E. 1962. Biogeographical and ecological factors contributing to the decline of Arctic grayling, Thymallus arcticus Pallas, in Michigan and Montana. Dissertation Ph.D. Univ. Michigan (typed) 169 pp.

_____. 1965. Bibliography of the Arctic grayling, Thymallus arcticus, of North America. Cir. 213, U.S. Bureau of Sport Fisheries and Wildlife. 15 pp.

LAHONTAN CUTTHROAT TROUT — Salmo clarki henshawi (Gill and Jordan, 1878)

Order: SALMONIFORMES — Family: SALMONIDAE

Significance: This subspecies is an important and beautiful sport fish, which reaches a large size (10 to 15 pounds) and is adapted to the highly alkaline waters of a few ancient lakes in the Lahontan Basin.

Distinguishing characteristics: Sports large, evenly distributed; gillbrakers 21-28; pyloric caeca typically 40-50; has a dash of red between the lower jaw and the isthmus; reaches a larger size than other cutthroats.

Present distribution: Pure populations are known to be in Independence Lake, California, Macklin Creek, California, and Summit Lake, Nevada, and a few tributaries in the Lahontan Basin. Possible hybrids are present in Pyramid and Walker Lakes, Catnip Reservoir, Truckee, Carson and Walker Rivers in Nevada, and Heenan Lake in California.

Former distribution: Lahontan Basin, California and Nevada.

Status: Scarce. The original populations are extinct in Pyramid Lake and Lake Tahoe.

Estimated numbers: Dr. Robert J. Behnke estimates that there are about 1,000 to 2,000 of the pure strain in Summit and Independence Lakes and about 1,000 in tributary streams. The possible hybrid strains are common in the waters mentioned above, except for Walker Lake where they are nearly extinct.

Fecundity: Adult females from Catnip Reservoir on the Sheldon National Antelope Refuge average about 2,500 eggs per fish; 230 to 315 eggs per ounce; about 1,200 eggs per pound of female.

Reasons for decline: Damage to spawning beds resulting from forest removal, fires and overgrazing; dams which block spawning runs; pollution; diversion of water for irrigation; and hybridization and competition with rainbow trout and other cutthroats.

Protective measures already taken: Rainbow trout and Heenan Lake cutthroat are no longer stocked in Independence Lake; Summit Lake was placed in a special protected category by the U.S. Bureau of Land Management. The Bureau of Sport Fisheries and Wildlife is constructing the Lahontan National Fish Hatchery (1970) for the primary purpose of rearing this subspecies. The hatchery began production in 1966. When completed, the hatchery will produce about 125,000 pounds of cutthroat trout annually.

Measures proposed: Improvements of the lower Truckee River to permit natural spawning are under consideration. Withdrawal of Macklin Creek into public ownership is also being considered.

Number in captivity: About 2 million eggs are taken annually from wild fish. This results in a million or so fry and several hundred thousand fingerlings.

Culture potential in captivity: The Lahontan cutthroat trout is difficult to rear. Until disease-free brood stock are obtained, it is necessary to take eggs from wild fish.

References:

Fisk, L. 1972. Status of certain depleted inland fishes. Calif. Dept. Fish and Game, Inland Fish Admin. Dept. No. 72-1: 13 p.

La Rivers, I. 1962. Fishes and fisheries of Nevada. Nevada State Fish and Game Commission, 782 p.

Trelease, T. J. 1969. The death of a lake. The rebirth of a lake. Nevada Outdoors and Wildlife Review, Vol. 3, No. 4, p. 4-14.

PAIUTE CUTTHROAT TROUT — Salmo clarki seleniris (Snyder, 1933)

Order: SALMONIFORMES — Family: SALMONIDAE

Distinguishing characteristics: Highly colored, typically with orange-red dash on dentary, few spots, ventral area clear white. Except for ventral surface, coloration somewhat similar to golden trout.

Present distribution: Very limited--Silver King Creek and its tributaries, Alpine County, Cottonwood Creek, and Inyo County, California; Delaney Creek, Yosemite National Park, California.

Former distribution: Alpine County, California, east of the Sierra Divide, in high mountains.

Status: Greatly depleted and in peril.

Estimated numbers: 500 adults.

Fecundity: Not known.

Reasons for decline: Overfishing, hybridization with rainbow trout, and limited range.

Protective measures already taken: A few successful transplants have been made by California Department of Fish and Game; hybrids were removed from Silver King Creek in 1965 and pure stock were introduced. Silver King Creek, Delaney Creek, and North Fork of Cottonwood Creek closed to angling.

Measures proposed: A survey of the current status of the species and the development of a plan for preservation, including establishment of pure populations.

Number in captivity: None.

Culture potential in captivity: No data.

Remarks: Data submitted by the Forest Service, U.S. Department of Agriculture and Dr. Robert J. Behnke, Colorado Cooperative Fishery Unit, Bureau of Sport Fisheries and Wildlife.

References:

Anonymous. 1965. Preserving the Paiute. Outdoor California, Vol. 26, No. 3, p. 3-4.

Fish, L. 1972. Status of certain depleted inland fishes. California Department of Fish and Game, Inland Fish. Admin. Dept., No. 72-1:13 p.

Snyder, J. O. 1934. A new California trout. Calif. Fish and Game 20(2):105-112.

Wales, J. H. 1957. Trout of California. Department of Fish and Game, Sacramento, California, 56 p.

GREENBACK CUTTHROAT TROUT — Salmo clarki stomias (Cope, 1871)

Order: SALMONIFORMES — Family: SALMONIDAE

Significance: Original native cutthroat trout in Eastern Slope streams in the South Platte River, Colorado.

Distinguishing characteristics: A small trout, rarely exceeding a pound in weight, general color, green, dark to almost black dorsally, spots large and sparse, fin reddish, prominent red throat; vertebrae 59-61; scales 180-215 in lateral series, 40-50 above lateral line; pyloric caeca 30-40.

Present distribution: Blackhollow Creek, Cache la Poudre River drainage and possibly a few isolated streams in Boulder and Larimer Counties, Colorado.

Former distribution: Arkansas and Platte drainages, Colorado and Wyoming.

Status: In peril.

Estimated numbers: Only 10 pure specimens known, September 1968.

Fecundity: No data, probably similar to other cutthroats.

Reasons for decline: Deterioration of habitat due to man's activities, competition from stocked trout, hybridization.

Protective measures already taken: Reclamation and restocking of certain waters in Rocky Mountain National Park.

Measures proposed: Stocking in reclaimed suitable waters, barrier dams to isolate populations, angling restrictions on certain streams, including Blackhollow Creek.

Number in captivity: None.

Culture potential in captivity: Poor. Eggs can be taken from wild fish.

Remarks: Data submitted by the Colorado Department of Game, Fish, and Parks, by Dr. Robert E. Vincent, and Dr. Robert J. Behnke, Colorado Cooperative Fishery Unit, Bureau of Sport Fisheries and Wildlife.

References:

Dieffenbach, W. H. 1964. Taxonomy and selected life history of cutthroat trout in the South Platte River Drainage, Colorado. Thesis, M.S., Colorado State University, 45 p.

_____. 1966. Taxonomy of the cutthroat trout (Salmo clarki Richardson) of the South Platte Drainage, Colorado. Copeia, No. 3, p. 414-424.

Jordan, D. S. 1891. Report of explorations in Colorado and Utah during the summer of 1889, with an account of the fishes found in each of the river basins examined. Bull. U.S. Fish Comm., Vol. 9, p. 1-40.

RIO GRANDE CUTTHROAT TROUT — Salmo clarki virginalis (Girard, 1856)

Order: SALMONIFORMES — Family: SALMONIDAE

Significance: Original native cutthroat trout in the Rio Grande drainage in Colorado.

Distinguishing characteristics: A large trout, reaches 24 to 30 inches in length, vertebrae 60-63; scales 145-175 in lateral series, 35-40 above lateral line.

Present distribution: Headwater streams on Trinchera Ranch, tributaries to Rio Grands, Costilla County, Colorado; also, a few streams in Sandoval and Taos Counties in northern New Mexico.

Former distribution: Headwaters of the upper Rio Grande drainage.

Status: Scarce.

Estimated numbers: No data.

Fecundity: Probably similar to other cutthroats.

Reasons for decline: Pollution, water diversion for irrigation, hybridization with introduced species, competition with introduced trouts.

Protective measures already taken: Brood stock were collected by the Colorado Game, Fish and Parks Department for propagation purposes; one stream in New Mexico is closed to fishing and a barrier was installed.

Measures proposed: Introduction in a new lake; culture for stocking suitable waters in the Rio Grande basin.

Number in captivity: No data.

Breeding potential in captivity: No data.

Remarks: Data submitted by Drs. R. E. Vincent and R. J. Behnke, Colorado Cooperative Fishery Unit, Bureau of Sport Fisheries and Wildlife and Region 3, U.S. Forest Service.

References:

Green, W. S., Jr. 1937. Colorado trout. Colorado Museum of Natural History Popular Series No. 2, 48 p.

Jordan, D. S. and B. W. Evermann. 1902. American food and game fish. Doubleday, Page & Co., N.Y. 572 p.

HUMBOLDT CUTTHROAT TROUT — *Salmo clarki* (subsp.)

Order: SALMONIFORMES — Family: SALMONIDAE

Significance: This hardy cutthroat trout has been able to thrive as pure populations in waters which have been heavily stocked with Yellowstone cutthroat, rainbow, and brook trouts.

Distinguishing characteristics: Spots medium-large, evenly distributed on body; scales in lateral series typically 125-145; gillrakers 19-23.

Present distribution: In about 20-30 small, headwater tributaries in Humboldt River drainage of Lahontan Basin, Nevada.

Former distribution: Probably throughout Humboldt River system.

Status: Very uncommon.

Estimated numbers: Populations vary according to size and conditions of streams from only a few dozen in areas where total habitat is restricted to one or two spring fed beaver ponds up to perhaps 1,000 individuals in the better streams. Most of these streams probably have less than 100 adult trout because the habitat is severely limited in this harsh, dry climate.

Fecundity: Unknown.

Reasons for decline: Deterioration and destruction of habitat due to agricultural practices and mining.

Protective measures already taken: None.

Measures proposed: None.

Number in captivity: None.

Breeding potential in captivity: Unknown.

Reference:

Behnke, R. J. 1960. Taxonomy of the cutthroat trout of the Great Basin. M.S. Thesis, University of California, Department of Zoology.

LITTLE KERN GOLDEN TROUT — *Salmo aquabonita gilberti* (Jordan, 1894)

Order: SALMONIFORMES — Family: SALMONIDAE

Distinguishing characteristics: Yellow-golden sides, often orange ventral region; dorsal, anal and pelvic fins tipped with white or orange; scales in lateral series, 140-175, above lateral line 32-38; pyloric caeca, 30-45; vertebrae 60-63; gillrakers 19-22.

Present distribution: Little Kern River and tributaries above falls near confluence with Doda Springs Creek and upper Coyote Creek, tributary to main Kern River, Sequoia National Forest, California.

Former distribution: All of the originally inhabitated trout waters of the Kern River basin, excluding the South Fork of the Kern.

Status: Scarce.

Estimated numbers: Perhaps a few thousand.

Fecundity: Unknown.

Reasons for decline: Hybridization with hatchery rainbow trout.

Protective measures already taken: Introductions ceased in Little Kern basin; Colorado Cooperative Fishery Unit Project funded by National Park Service for study of the present trout populations of upper Kern basin--to be completed spring, 1969.

Measures proposed: Introductions into barren or reclaimed waters.

Number in captivity: None.

Breeding potential in captivity: Unknown.

Remarks: Data submitted by Dr. Robert J. Behnke, Colorado Cooperative Fishery Unit, Bureau of Sport Fisheries and Wildlife.

Reference:

Behnke, R. J. 1973. (Personal communications).

Schreck, C. B. 1969. Trouts of the upper Kern River Basin, California. Thesis, M.S., Colorado State University.

_____ and R. J. Behnke. 1971. Trouts of the Upper Kern River Basin, California with reference to systematics and evolution of Western North American *Salmo*. J. Fish. Res. Bd. Canada 28:987-998.

GILA TROUT — Salmo gilae (Miller, 1950)

Order: SALMONIFORMES — Family: SALMONIDAE

Distinguishing characteristics: Extremely fine, profuse spotting on dorsal and anal fins; large adipose fin; body deep golden yellow.

Present distribution: Restricted to Diamond, McKenna and Spruce Creeks in the Black Range Primitive Area of the headwaters of the Gila River, Gila National Forest, New Mexico.

Former distribution: Widespread in all suitable upper tributaries of the Gila and San Francisco Rivers in New Mexico.

Status: Precarious condition.

Estimated numbers: 4,300 in Diamond Creek.

Fecundity: 200 to 600 eggs per adult female.

Reasons for decline: Modification of habitat resulting from forest removal and the introduction of exotic trout competitors.

Protective measures already taken: Streams are closed to fishing and to the introduction of exotics; stream improvement devices were rebuilt; studies have been implemented.

Measures proposed: Introduction in a barren stream further north where water flows are more stable; propagation and restocking in reclaimed streams near present habitat.

Number in captivity: None.

Culture potential in captivity: No data.

Remarks: Data submitted by Dr. Robert R. Miller, University of Michigan, and Dr. Robert E. Vincent, Colorado State University.

References:

Miller, R. R. 1950. Notes on the cutthroat and rainbow trouts with the description of a new species from the Gila River, New Mexico, Occ. Pap. Mus. Zool. Univ. Mich., No. 529, 42 p.

Regan, D. M. 1964. Ecology of the Gila trout, Salmo gilae, in Main Diamond Creek, New Mexico. Thesis, M.S. Colorado State University, 57 p.

ARIZONA (APACHE) TROUT — Salmo sp.

Order: SALMONIFORMES — Family: SALMONIDAE

Distinguishing characteristics: Similar to Gila trout, Salmo gilae; differs in that the Arizona trout has larger and fewer spots on the dorsal and anal fins, narrower body width, smaller adipose fin and larger pectoral, pelvic, and dorsal fins.

Present distribution: Ord Creek and East Fork of White River, Christmas Tree and Sun Moon Lakes; Fort Apache Indian Reservation, Arizona.

Former distribution: Widespread in suitable upper tributaries of the White and Black Rivers.

Status: Jeopardized. Presently restricted to two small streams and two small lakes.

Estimated numbers: No data.

Fecundity: 200 to 500 eggs per adult female.

Reasons for decline: Modification of habitat resulting from forest removal; introduction of exotic trout competitors.

Protective measures already taken: Several streams in Arizona were stocked by the State. Ord Creek and the upper East Fork of the White River are closed to fishing. Barrier dams were constructed on both streams. The White Mountain Apache Tribe constructed two lakes for this trout.

Measures proposed: Increased hatchery production. Restock in suitable reclaimed waters.

Number in captivity: Several thousand at Arizona State hatchery.

Culture potential in captivity: Propagated in similar manner to the propagation of rainbow and other trouts.

References:

Miller, R. R. 1950. Notes on the cutthroat and rainbow trouts with the description of a new species from the Gila River, New Mexico. Occ. Pap. Mus. Zool. Univ. Mich., No. 529, 42 p.

Regan, D. M. 1964. Comparison of morphometric measurements for Gila trout and Ord Creek trout. Report (typed) Fed. Aid Project F-22-R, New Mexico Department of Game and Fish, 20 p.

SUNAPEE TROUT — Salvelinus aureolus (Bean, 1887)

Order: SALMONIFORMES — Family: SALMONIDAE

Distinguishing characteristics: Back brownish colored, without vermiculation; anal rays usually eight.

Present distribution: Flood's Pond, Hancock County, Maine.

Former distribution: Irregularly in Lakes in New Hampshire, Vermont, and Maine.

Status: Very uncommon and restricted.

Estimated numbers: Unknown.

Fecundity: Similar to brook trout.

Reasons for decline: Extensive hybridization following introductions of other chars to the native waters of these species.

Protective measures already taken: Flood's Pond is closed to fishing as a public water supply. Introduction of other species to the pond is actively opposed.

Measures proposed: None.

Number in captivity: None.

Culture potential in captivity: No data.

Remarks: Attempts to propagate this species in other New England states have led to extensive hybridization thus making it almost impossible to define the sunapee trout as a taxon other than to refer to the Flood's Pond population. Apparently pure stocks of this "species" cannot exist sympatrically with the lake trout, therefore artificial propagation and distribution to preserve this species are not recommended.

Data submitted by the Maine Department of Inland Fisheries and Game, Division of Fishery Research and Management.

References:

Everhart, W. H. 1958. Fishes of Maine. The Maine Department Inland Fisheries and Game. Augusta.

_____ and C. A. Waters. 1965. Life history of the blueback trout (Arctic char, Salvelinus alpinus (Linnaeus) in Maine. Trans. Am. Fish. Soc., Vol. 94, No. 4, p. 393-397.

Jordan, D. S. and B. W. Evermann. 1902. American food and game fish. Doubleday, Page & Co., N.Y. 572 p.

Kendall, W. C. 1914. Fishes and fishing in Sunapee Lake. Rpt. Comm. Fish. 1912, Bur. Fish. Doc. No. 783, 96 p.

BLUEBACK TROUT — Salvelinus alpinus oquassa (Girard, 1854)

Order: SALMONIFORMES — Family: SALMONIDAE

Distinguishing characteristics: Back dark blue, without vermiculation; anal rays usually nine or ten.

Present distribution: At least eight lakes in the head-waters of the St. John and Penobscot Rivers, Northwestern Maine.

Status: Scarce. Exact taxonomic position of this fish is unresolved.

Estimated numbers: Unknown.

Fecundity: No data.

Reasons for decline: Unrestricted exploitation of the spawning runs in some localities. Decline may also be related to increased populations of landlocked salmon in the Rangeley Lakes.

Protective measures already taken: Restrictive creel limit, prevention of introduction of undesirable competing species in waters inhabited by blueback trout.

Measures proposed: None.

Number in captivity: Unknown.

Culture potential in captivity: Unknown. (Unsuccessful, 1963).

Remarks: Existing populations are generally not very desirable from the angler's viewpoint. Usually available for angling only in the spring and in the fall during spawning season. Under present conditions, the only danger to this species would be the introduction of a more successful competitor. Data submitted by the Maine Department of Inland Fisheries and Game, Division of Fishery Research and Management.

References:

Everhart, W. H. 1958. Fishes of Maine. The Maine Department of Inland Fisheries and Game. Augusta.

_____ and C. A. Waters. 1965. Life history of the blueback trout (Arctic char, Salvelinus alpinus (Linnaeus) in Maine. Trans. Am. Fish. Soc., Vol. 94, No. 4, p. 393-397.

Jordan, D. S. and B. W. Evermann. 1902. American food and game fish. Doubleday, Page & Co., N.Y. 572 p.

OLYMPIC MUDMINNOW — Novumbra hubbsi (Schultz, 1929)

Order: SALMONIFORMES — Family: UMBRIDAE

Significance: This species is of interest to ichthyologists as it is a relict population which is found only in three streams in the Olympic Peninsula in western Washington. Except for the taxonomic description, very little is known about this small fish.

Distinguishing characteristics: A small fish, about $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long. Differs from Umbra in having more than 47 scales along the lateral line and does not have a dark bar at the base of the tail. Differs from the Alaskan blackfish, Dallia pectoralis in that the caudal fin of the Olympic mudminnow is slightly concave whereas the caudal fin in Dallia is rounded.

Present distribution: Chehalis River watershed, specifically from the Satsop River and the Deschutes River in the Olympic Peninsula in western Washington.

Former distribution: According to Schultz (1929) this mudminnow is a representative of an ancient fauna which extended across the North American continent prior to the elevation of the Rocky Mountains. Fossil remains are found in the Eocene Green River Shales of Wyoming.

Status: Greatly restricted habitat.

Estimated numbers: No data.

Fecundity: Not known.

Reasons for decline: Change in habitat during geological history.

Protective measures already taken: None.

Measures proposed: Suitable habitat should be set aside as a sanctuary.

Number in captivity: No live specimens.

Culture potential in captivity: Unknown.

References:

Fitzgerald, J. W. 1957. Range extension for the western mudminnow, Novumbra hubbsi Schultz. Copeia, p. 248.

Meldrim, J. W. 1968. The ecological zoogeography of the Olympic mudminnow Novumbra hubbsi Schultz. Thesis, Ph.D., University of Washington, 157 p.

Schultz, L. P. 1929. Description of a new type of mudminnow from western Washington with notes on related species. Publications in Fisheries, University of Washington, Vol. 2, No. 6, p. 73-81.

DESERT DACE — Eremichthys acros (Hubbs and Miller, 1948)

Order: CYPRINIFORMES — Family: CYPRINIDAE

Distinguishing characteristics: A monotypic genus of small minnows with 5-4 teeth, prominent horny sheaths on each jaw, and fine scales (70-80 in lateral line) that bear radii on all fields.

Present distribution: Known only from Soldier Meadows west of the Black Rock Desert in Humboldt County, Nevada.

Former distribution: Believed to be a relict form that is now restricted to warm-spring habitats.

Status: Scarce. Dr. Robert R. Miller now believes this species exists in larger numbers than previously known and its status should be considered less precarious than previously thought. (pers. comm. Dr. Willis King).

Estimated numbers: At least 100,000 in 1965 (Dr. R. R. Miller).

Fecumdity: No data.

Reasons for decline: Habitat destruction by use of bulldozer in diverting water has eliminated the species from some areas where it was formerly plentiful.

Protective measures already taken: None

Measures proposed: Set aside part of warm-spring habitat as a sanctuary or wildlife monument.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Like Moapa coriacea, this fish represents an endemic, relict genus of great scientific interest. Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Hubbs, C. L. and R. R. Miller. 1948. Two new relict genera of cyprinid fishes from Nevada. Occ. Pap. Mus. Zool., Univ. Mich., No. 507, 30 p.

La Rivers, I. 1962. Fish and fisheries of Nevada. Nevada State Fish and Game Commission, 782 p.

HUMPBACK CHUB — Gila cypha (Miller, 1946)

Order: CYPRINIFORMES — Family: CYPRINIDAE

Distinguishing characteristics: A strongly compressed Gila with the sides of the body slightly convex and with a prominent abrupt hump over the occiput; body almost entirely devoid of scales (except along lateral line) which have basal radii. Fins expansive, flacate; snout fleshy; mouth inferior; eye very small.

Present distribution: Green and Colorado Rivers, from Grand Canyon area northward to vicinity of Flaming Gorge Dam on Utah-Wyoming border.

Former distribution: Unknown.

Status: Occurs in such small numbers in widely separated places that it is considered as probably in jeopardy.

Estimated numbers: Unknown.

Fecundity: Unknown.

Reasons for decline: Unknown.

Protective measures already taken: Research studies are now attempting to determine the distribution, abundance, and ecology of this form and to determine its proper taxonomic status.

Measures proposed: Continuation of the above research studies.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: This fish has been taken in very small numbers from widely separated points in the Green and Colorado Rivers. The original specimens came from the Grand Canyon. Six or seven additional specimens were taken from the Hideout Flat area of the Green River near the Wyoming line (now inundated by Flaming Gorge Dam). Additional fish have been taken in the Lee's Ferry area of the Colorado River and in the Green River near the confluence of the White and Duchesne Rivers. Data submitted by Dr. D. R. Franklin, Utah Cooperative Fishery Unit, Utah State University.

References:

Miller, R. R. 1946. Gila cypha, a remarkable new species of cyprinid fish from the Colorado River in Grand Canyon, Arizona. Jour. Wash. Acad. Sci., Vol. 36, No. 12, p. 409-415.

_____. 1961. Man and the changing fish fauna of the American Southwest. Pap. Mich. Acad. Sci., Arts, and Letters. 46(1960), p. 365-404.

Holden, P. B. 1970. Systematic studies of cyprinid genus Gila in the upper Colorado River Basin. Copeia. No. 3, pp. 409-420.

PAHRANAGAT BONYTAIL — Gila robusta jordani

Order: CYPRINIFORMES — Family: CYPRINIDAE

Distinguishing characteristics: Similar to Gila robusta robusta but differs by being less elongate, having more scales above, below and on the lateral line and in coloration.

Present distribution: Outflow of Crystal and Ash Spring, Pahranagat Valley, Lincoln County, Nevada.

Former distribution: Throughout most of the streams in Pahranagat Valley.

Status: In jeopardy because of extreme localization.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Irrigation development and establishment of competitive and predatory exotic species throughout the range of this species.

Protective measures already taken: None.

Measures proposed: Transplant the species into suitable habitat.

Number in captivity: None.

Breeding potential in captivity: Probably poor.

Remarks: Collecting trips to Pahranagat Valley in 1967 and 1968 resulted in locating very few of these fishes. La Rivers (1962) saw the species at Crystal Spring in 1948-49. Tanner (1950) designated Crystal Spring the type locality. The fish currently appears to be restricted to a small population living in a short section of stream above a main irrigation ditch which accepts the combined outflow from Crystal and Ash Springs. It has not been seen or taken in the outflow from Crystal Spring above the confluence with Ash Spring waters. Submitted by Dr. James E. Deacon, Nevada Southern University, Las Vegas, Nevada, September 8, 1968.

Reference:

Deacon, J. E. Unpublished data.

MOHAVE CHUB — Gila (Siphateles) mohavensis (Snyder, 1918)

Order: CYPRINIFORMES — Family: CYPRINIDAE

Distinguishing characteristics: A lacustrine-type chub with 18 to 29 (usually 21-27) gill rakers, a moderately oblique mouth, and a slender pharyngeal arch.

Present distribution: A pure population is known only from Lake Tuendae, Zzyzx Resort, 9 miles south of Baker, California. Similar chubs have been located in the Owens River, but have not yet been identified (1970).

Former distribution: Mohave River basin, California.

Status: Jeopardized.

Estimated numbers: Several thousand.

Fecundity: No data.

Reasons for decline: Introduction of exotic fish competitors, particularly, Gila orcutti, the arroyo chub, with which the native species has hybridized.

Protective measures already taken: The California Department of Fish and Game has introduced this species in 3 other areas (1969-1970). The owner of the Resort is sympathetic toward maintaining the species. Classed endangered and protected by California law.

Measures proposed: Surveillance of transplant areas and additional transplants.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data provided by Dr. Robert R. Miller, University of Michigan and the California Department of Fish and Game. Recommended as endangered by Desert Fishes Council.

References:

Hubbs, C. L. and R. R. Miller. 1943. Mass hybridization between two genera of cyprinid fishes in the Mohave Desert, California. Pap. Mich. Acad. Sci., Arts, and Letters, 28. p. 343-378.

Miller, R. R. 1968. Records of some native freshwater fishes transplanted into various waters of California, Baja, California, and Nevada. California Fish and Game, Vol. 54, No. 3, p. 170-179.

LITTLE COLORADO SPINEDACE — Lepidomeda vittata (Cope, 1874)

Order: CYPRINIFORMES — Family: CYPRINIDAE

Distinguishing characteristics: A two to four-inch silvery minnow with the 2 anterior dorsal rays spinelike, 8 anal rays, pharyngeal teeth in main row 4-4, and lateral-line scales usually more than 90.

Present distribution: Upper part of the Little Colorado River basin, eastern Arizona.

Former distribution: Similar to present, only more abundant and widespread.

Status: Very uncommon. Found only in a few streams.

Estimated numbers: No data.

Fecundity: Egg counts for 12 females ranged from 650 to 5,600 (2-4 inch fish).

Reasons for decline: Reductions in stream flow, introduction of exotics, domestic pollution, and chemical rehabilitation of habitat.

Protective measures already taken: U.S. Forest Service considers the possible effects on habitat by any new projects in the area; a refuge was established on East Clear Creek.

Measures proposed: Prevent introductions of exotic fishes; restrict collecting; introduce this species in another drainage.

Number in captivity: None.

Culture potential in captivity: Unknown.

References:

Miller, R. R. 1963. Distribution, variation, and ecology of Lepidomeda vittata, a rare cyprinid fish endemic to eastern Arizona. Copeia, 1963, No. 1, p. 1-5.

Minckley, W. L. and L. H. Carufel. 1967. The Little Colorado River spinedace, Lepidomeda vittata, in Arizona. Southwestern Naturalist, Vol. 12, No. 3, p. 291-302.

MOAPA DACE — Moapa coriacea (Hubbs and Miller, 1948)

Order: CYPRINIFORMES — Family: CYPRINIDAE

Distinguishing characteristics: A monotypic genus with 5-4 dentition, hidden premaxillary frenum, small (70-80) deeply embedded scales in leathery-textured skin, and a prominent black spot at caudal base.

Present distribution: Restricted to warm springs and their outlets near source of Moapa (Muddy) River, Clark County, Nevada.

Former distribution: Not known to be different from present.

Status: In peril.

Estimated numbers: 500 to 1,000.

Fecundity: Unknown.

Reasons for decline: The springs and headwaters of Moapa River are being altered for various commercial domestic water uses; competition from exotic species; only one population remains completely undisturbed.

Protective measures already taken: None.

Measures proposed: Set aside Warm Springs Ranch as a wildlife monument; prevent habitat alteration by man.

Number in captivity: None.

Culture potential in captivity: Not likely to reproduce well.

Remarks: This genus is known only from a very restricted area; it is a biological relict threatened by exotic species (gambusia, bullfrogs) and a proposed irrigation and dam project. Data submitted by Dr. Robert R. Miller, University of Michigan, and Dr. James E. Deacon, Nevada Southern University, Las Vegas.

References:

Hubbs, C. L. and R. R. Miller. 1948. Two new, relict genera of cyprinid fishes from Nevada. Occ. Pap. Mus. Zool. Univ. of Mich., No. 507, 30 p.

La Rivers, I. 1962. Fish and fisheries of Nevada, Nevada State Fish and Game Commission, 782 p.

Minckley, W. L. and J. E. Deacon. 1968. Southwestern fishes and the enigma of "endangered fishes." Science 159 (3822), p. 1424-1432.

WOUNDFIN — Plagopterus argentissimus (Cope, 1874)

Order: CYPRINIFORMES — Family: CYPRINIDAE

Significance: This, the most specialized of the 3 genera of the Plagopterini, is ecologically restricted to a swift-river habitat.

Distinguishing characteristics: A member of the specialized New World tribe Plagopterini (with spinelike rays in dorsal and pelvic fins) that lacks scales, has the head and belly flattened, is bright silvery, has a well developed barbel, has the intermandibular region spongy, a long first dorsal spine, and a nearly horizontal mouth.

Present distribution: Now virtually restricted to the Virgin River below Hurricane, Utah.

Former distribution: The lower Colorado and Gila River basins in Arizona, Nevada and Utah.

Status: Jeopardized.

Estimated numbers: Unknown.

Fecundity: Unknown.

Reasons for decline: Modification of habitat by man. The species is adapted to life in sandy, swift, turbid rivers.

Protective measures already taken: None.

Measures proposed: Research to determine habitat requirements so as to establish a population elsewhere if the proposed dam above St. George, Utah, is funded. If the dam is not built, establish the Virgin River below the narrows as a sanctuary.

Number in captivity: None.

Breeding potential in captivity: It is questionable whether the species can be cultured.

Remarks: Data provided by Dr. James E. Deacon, Nevada Southern University, Las Vegas, and Dr. Robert R. Miller, University of Michigan.

References:

La Rivers, I. 1962. Fish and fisheries of Nevada. Nevada State Fish and Game Commission, 782 p.

Miller, R. R. and C. L. Hubbs. 1960. The spiny-rayed cyprinid fishes (Plagopterini) of the Colorado River system. Misc. Publ. Mus. Zool. Univ. Mich., 115, 39 p.

Minckley, W. L. and J. E. Deacon. 1968. Southwestern fishes and the enigma of "endangered species." Science, 159 (3822), p. 1424-1432.

COLORADO SQUAWFISH — Ptychocheilus lucius (Girard, 1856)

Order: CYPRINIFORMES — Family: CYPRINIDAE

Distinguishing characteristics: Body slender, dusky-greenish above, sides silvery, belly yellowish to whitish; long, slender, depressed head, caudal peduncle stout, lateral line decurved, eye small, pharyngeal teeth 2, 5-4, 2; dorsal and anal fin rays 9.

Present distribution: Middle and lower Green River, main Colorado River above Lake Powell, and Salt River.

Former distribution: Widely distributed in the Colorado River and major tributaries.

Status: Seriously depleted.

Estimated numbers: Unknown.

Fecundity: Natural reproduction is known to occur only in the Yampa River and the Green River below the mouth of the Yampa down to the confluence of the Colorado River.

Reasons for decline: Modification of habitat by man through construction of large reservoirs. The species will not reproduce in cold tailwaters below high dams nor in reservoirs behind these dams. The species is adapted to life in turbid, swift, warm rivers. Introduced fishes may have a decimating effect in waters not affected by dams.

Measures proposed: No water developments should be made on the Yampa River upstream from Dinosaur National Monument which would lower the stream temperature to that below the levels required for reproduction of the species. Studies on ecological and reproductive requirements should be continued.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

Remarks: The very specialized ecological requirements for spawning and successful natural reproduction are the major factors contributing to the reduction in numbers of this species.

References:

Girard, C. 1856. Researches upon the cyprinoid fishes inhabiting the fresh waters of the United States of America, west of the Mississippi Valley, from specimens of the Smithsonian Institution. Acad. Nat. Sci. Phila. Proc. 8 (1856), p. 165-213.

Miller, R. R. 1961. Man and the changing fish fauna of the American Southwest. Pap. Mich. Acad. Sci. Arts and Letters. Vol. 46, (1960), p. 365-404.

Vanicek, C. D. and R. H. Kramer. 1969. Life history of the Colorado squawfish, Ptychocheilus lucius, and the Colorado Chub, Gila robusta, in the Green River in Dinosaur National Monument, 1964-1966, Trans. Amer. Fish. Soc. Vol. 98. No. 2. p. 193-208.

Vanicek, C. D., R. H. Kramer and the late D. R. Franklin. 1970. Distribution of Green River fishes in Utah and Colorado following closure of Flaming Gowge Dam. Southwest. Nat. Vol. 14, No. 3, p. 297-315.

KENDALL WARM SPRINGS DACE — Rhinichthys osculus thermalis (Hubbs)

Order: CYPRINIFORMES — Family: CYPRINIDAE

Distinguishing characteristics: Smaller and with fewer scales than Green River dace. When breeding, the males are purplish, females greenish in color, 2-3 inches long.

Present distribution: This subspecies is apparently a result of geographical isolation. It is found only in Kendall Warm Springs, tributary to the Green River in Wyoming and near the site of the old Kendall R.S., Bridger N.F.

Former distribution: Same as above.

Status: In peril because of comparatively small population, small area of habitat, and easy access to it. Exact taxonomic position of this fish is unresolved.

Estimated numbers: Not known.

Breeding rate in the wild: Known to spawn from June to September.

Reasons for decline: Limited habitat and use by fishermen for bait.

Protective measures already taken: Unknown.

Measures proposed: Prohibit seining or otherwise taking fish from Kendall Warm Springs.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

Remarks: Kendall Warm Springs should be set aside as a sanctuary much like the Kirtland Warbler Area and reserved for the Kendall Warm Springs Dace. This is the only place this subspecies exists. The stream in which it lives is made up of the flow from a group of warm springs and is isolated from the Green River by a ten foot waterfall built up by its own deposits. The stream has a depth of only one to two feet and a temperature of 85 degrees F. The altitude is approximately 7,800 feet. There has been a proposal for a B. of R. dam on the Green River which would inundate these springs. Should this transpire, the existing population could only be preserved by transplanting to a suitable site.

References:

Green, A. F. C. Personal records.

Simon, J. R. 1946. Wyoming fishes. Wyoming Game & Fish Department Bulletin No. 4, 129 pp.

WHITE RIVER (MOUNTAIN) SUCKER — Catostomus clarki intermedius (Tanner, 1942)

Order CYPRINIFORMES — Family: CATOSTOMIDAE

Distinguishing characteristics: Less than 35 scales anterior to the dorsal fin; fontanelle closed; notch at each corner of mouth; edge of jaw inside lower lip with a hard cartilaginous sheath; head long and slender, depth about 2/3 of the length; interorbital width 2.1 of length; width of mouth contained four times in length of head; papillae in 4 rows on upper lip and 8-9 rows on lower lip.

Present distribution: Remnant waters of the pluvial White River in White River Valley, Nevada.

Former distribution: Same as present.

Status: A matter of concern. Situation reported as improving (1972).

Fecundity: Unknown.

Reasons for decline: Decline not documented but suspected as a result of irrigation alterations of streamflow and establishment of exotic fishes.

Protective measures already taken: None.

Measures proposed: None.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Remnant waters still contain populations of this form. Former abundance cannot be documented but the alterations of habitat and establishment of Cyprinus carpio, Lebistes reticulatus and Gambusia affinis in waters occupied by Catostomus clarki intermedius suggest that the latter species may not be as abundant as formerly. It can still be collected with some effort in cooler springs and their outflows in White River Valley. Data provided by Dr. James E. Deacon, Nevada Southern University, Las Vegas.

References:

La Rivers, I. 1962. Fishes and fisheries of Nevada. Nevada State Fish and Game Commission, 782 p.

Smith, G. 1966. Distribution and evolution of the North American Catostomid fishes of the subgenus Pantosteus, genus Catostomus, Univ. Mich. Mus. Zool. Misc. Publ. 129, 132 p.

MODOC SUCKER — Catostomus microps (Rutter, 1908)

Order: CYPRINIFORMES — Family: CATOSTOMIDAE

Distinguishing characteristics: A small, dusky sucker with orange fins; D. 10 or 11, the fin rounded; 73-91 scales in lateral line; eye small; posterior fontanelle of skull of adult very narrow to closed.

Present distribution: Found in Rush Creek, a small tributary to Ash Creek, and in Ash Creek, near Adin, Modoc County, California; in the Pit River drainage of the Sacramento River basin.

Former distribution: Not known to be different from present distribution.

Status: Scarce but more fish found and distributed more widely than previously realized. Collected (May 10, 1968) by California Department of Fish and Game to determine whether the species still survives (it had been reported to be extinct). Its survival not threatened. Habitat reasonably secured and recent observations indicate wider distribution than formerly known (pers. comm. L. Fisk).

Estimated numbers: Fair numbers.

Fecundity: Unknown.

Reasons for decline: No definite data on former decline, but probably habitat alteration.

Protective measures already taken: Fully protected under California Fish and Game code. Portions of known habitat on Forest Service land.

Measures proposed: Set aside a section of Rush Creek as a natural area.

Number in captivity: None.

Breeding potential in captivity: Unknown.

Remarks: This species is believed to be a disjunct, southern relict related to the longnose sucker, Catostomus catostomus. It is sympatric with the Sacramento sucker, Catostomus occidentalis (J. K. Winther, pers. comm., 1967). Data provided by Dr. Robert R. Miller, University of Michigan, Ann Arbor. Collected in Rush Creek in 1969, 1970 and 1971. Discovered in Ash Creek in 1971.

Reference:

Fisk, L. 1972. Status of certain depleted inland fishes. California Department of Fish and Game, Inland Fish Admin. Dept., No. 72-1: 13 p.

Rutter, C. 1908. The fishes of the Sacramento/San Joaquin basin, with a study of their distribution and variation. Bull. U.S. Bur. Fish., 27 (1907): 103-152, figs. 1-4, pl. 6.

CUI-UI — Chasmistes cujus (Cope, 1883)

Order: CYPRINIFORMES — Family: CATOSTOMIDAE

Distinguishing characteristics: A large, heavy-bodied sucker, commonly reaches 6 pounds in weight, with subterminal mouth, thin non-papillose lips, oblique lower jaw, and fewer than 70 scales in the lateral line.

Present distribution: Pyramid Lake, Washoe County, Nevada.

Former distribution: Pyramid and Winnemucca Lakes and the lower part of Truckee River, Nevada.

Status: Seriously depleted. The relict lake suckers of the genus Chasmistes (3 recognized living species) are either extinct or threatened. This one has the best chance for survival. It is of both economic (to the Indians) and biological importance.

Fecundity: Not known. Eggs are small and numerous.

Reasons for decline: Declining flow in lower Truckee River due to dams and irrigation.

Protective measures already taken: Catch limits have been imposed on non-Indians. Plans have been suggested for spawning habitat restoration.

Measures proposed: Restoration of spawning access and habitat. Increased effort at artificial propagation and stocking of young in Pyramid Lake and, if possible, in some other suitable lake.

Number in captivity: None.

Culture potential in captivity: Has not been reared in captivity beyond the yolk-sac stage.

Remarks: This is a relict genus with 3 recognized living species inhabiting western lakes. It was more widespread and speciose in the Plio-Pleistocene epochs. Data submitted by Dr. Robert R. Miller, University of Michigan and by the Nevada Fish and Game Department.

References:

Johnson, V. K. 1958. Pyramid Lake. Fisheries Management Report. Nevada Fish and Game Commission, Dingell Johnson Project FAF-4R, 47 p., 17 graphs, 3 maps, 3 tables.

La Rivers, I. 1962. Fish and fisheries of Nevada. Nevada State Fish and Game Comm., 782 p.

Miller, R. R. 1965. Quaternary freshwater fishes of North America. In press in INQUA volume to be distributed in August at Boulder, Colorado.

_____, and G. R. Smith. 1967. New fossil fishes from Plio-Pleistocene Lake, Idaho. Occ. Pap. Mus. Zool. Univ. Mich., No. 654, 24 p.

Snyder, J. O. 1917. The fishes of the Lahontan system of Nevada and northeastern California. Bull. U.S. Bur. Fish., 35 (1915-16): 31-86, figs. 1-9, pls. 3-4, 1 map.

OZARK CAVEFISH — Amblyopsis rosae (Eigenmann, 1899)

Order: PERCOPSIFORMES — Family: AMBLYOPSIDAE

Distinguishing characteristics: Postcleithrum absent, sensory papillae in 2 or 3 rows on upper and lower half of caudal fin, pelvic fins absent.

Present distribution: Known only from a few caves and wells in southwestern Missouri and northwestern Arkansas.

Former distribution: About the same as present.

Status: In need of careful watching.

Estimated numbers: Cave populations range from 20 to 100.

Fecundity: About 20 eggs per female. Only 20 percent of the population breeds each year.

Reasons for decline: No data. There is a danger of overcollecting.

Protective measures already taken: None.

Measures proposed: Acquisition of certain caves and restriction of collection.

Number in captivity: Dr. T. L. Poulson has a few at Yale University.

Culture potential in captivity: No data.

Remarks: This species lives in underground water and moves from one spring or cave pool to another by underground water passages common in the Ozarks. Data submitted by the Missouri Conservation Commission.

References:

Poulson, T. L. 1963. Cave adaptation in amblyopsid fishes. Amer. Midl. Nat., Vol. 70, No. 2, p. 257-290.

Woods, L. P. and R. F. Inger. 1957. The cave, spring and swamp fishes of the family Amblyopsidae of central and eastern United States. Amer. Midl. Nat. Vol. 58, No. 1, p. 232-256.

DEVILS HOLE PUPFISH — Cyprinodon diabolis (Wales, 1932)

Order: ATHERINIFORMES — Family: CYPRINODONTIDAE

Distinguishing characteristics: Small size (generally less than 25 mm. S.L.), no pelvic fins, caudal fin convex, no vertical bars in females.

Present distribution: Restricted to a single, spring-fed pool in Ash Meadows, Nye County, Nevada, east of Death Valley California.

Former distribution: Likely a Pliocene relict.

Status: Jeopardized.

Estimated numbers: 300 to 800; at times as few as 125 breeding adults.

Fecundity: Good if undisturbed.

Reasons for decline: Decline of water level in Devils Hole. This is possibly due to removal of water from the aquifer for irrigation.

Protective measures already taken: 40 acres set aside in 1952 as a detached section of Death Valley National Monument. In 1967, a new fence was added. In 1970, an artificial spawning platform was added. Electric lights were installed over the platform.

Measures proposed: Continued surveillance by National Park Service personnel. Attempt to establish this pupfish in other suitable habitats.

Number in captivity: Alan McCrady, Sacramento, California, has a few which he is rearing in aquaria.

Culture potential in captivity: Good, but temperature must be kept around 90 degrees F. and heavy algae growths must be maintained.

Remarks: Any species as restricted in distribution and number as is this one must be considered to be threatened. Since its legal protection, its existence has at times been more precarious than heretofore. Data submitted by Dr. Robert R. Miller, University of Michigan, and by Dr. John P. Harville, San Jose State College.

References:

Cry California. 1970. Special report on the pupfish of the Death Valley region. Jour. of California Tomorrow, Vol. 5, No. 2, spring 1970, San Francisco, 26 p.

Miller, R. R. 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich., 68, 155 p.

_____. 1961. Speciation rates in some freshwater fishes of western North America. In: Vertebrate Speciation, W. Frank Blair, Ed. Univ. Texas Press, 1961, p. 537-560.

U.S. Department of the Interior. 1970. A task force report on let's save the desert pupfish. Washington, D.C., 8 p.

COMANCHE SPRINGS PUPFISH — *Cyprinodon elegans* (Baird and Girard, 1853)

Order: ATHERINIFORMES — Family: CYPRINODONTIDAE

Distinguishing characteristics: Slender body, crossbars absent on sides.

Present distribution: Outflow (irrigation ditches) of Phantom Lake Spring, near Toyahvale, Texas.

Former distribution: Large springs at Fort Stockton, Phantom Lake (now dry) and adjoining springs.

Status: Precarious condition. Numbers greatly diminished in past 20 years.

Estimated numbers: Not available.

Fecundity: Excellent when undisturbed.

Reasons for decline: Use of fish toxins, introduction of aggressive competitors, and lowering of water table.

Protective measures already taken: None.

Measures proposed: Set aside a suitable area in present range as sanctuary.

Number in captivity: None.

Culture potential in captivity: Unknown, but other species of this genus have been reared with success.

Remarks: This endemic Texan species was very abundant in its native springs in 1938. Since about 1950 it has been increasingly threatened by man's activities until its total population is only a fraction of what it was. Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Miller, R. R. 1961. Man and the changing fish fauna of the American southwest. Pap. Mich. Acad. Sci., Arts, and Letters, 46 (1960): 365-404, fig. 1.

Moore, G. A. 1957. Fishes. In: Vertebrates of the United States. McGraw Hill, Inc. p. 157.

TECOPA PUPFISH — Cyprinodon nevadensis calidae (Miller, 1948)

Order: ATHERINIFORMES — Family: CYPRINODONTIDAE

Distinguishing characteristics: A large-scaled form of the Cyprinodon nevadensis with narrower interorbital, more posteriorly placed pelvic fins, and a wider body.

Present distribution: A reservoir and small nearby creek flowing from a dug well at Jeds Motel, Tecopa Hot Springs, about 7 miles south of Shoshone, Inyo County, California.

Former distribution: Outflows of North and South Tecopa Hot Springs, Inyo County, California, in the Amargosa River basin.

Status: This subspecies was believed to be virtually extinct in 1966, since in January only 2 individuals were noted in the outflows of the 2 hot springs. Since then, 2 additional populations were discovered.

Estimated numbers: Insufficient data.

Fecundity: Unknown.

Reasons for decline: Introduction of the mosquitofish, Gambusia affinis (a known predator), ditching of spring outflows, and probably water contamination.

Protective measures already taken: Classed as endangered by State of California; fully protected by State law.

Measures proposed: Locate whatever surviving populations may exist and establish refuges.

Number in captivity: None.

Breeding potential in captivity: Unknown, but other subspecies of Cyprinodon nevadensis have been reared.

Remarks: The very restricted (and now mostly artificial) habitat of this subspecies means that it will have to be monitored if it is to survive. Data provided by Dr. James E. Deacon, Nevada Southern University, Las Vegas, and Dr. Robert R. Miller, University of Michigan, Ann Arbor. Recommended as endangered by Desert Fishes Council.

Reference:

Miller, R. R. 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich., 68: 1-155, figs. 1-5, maps 1-3, pls. 1-15.

NEVADA PUPFISH — Cyprinodon nevadensis mionectes (Miller, 1948)

Order: ATHERINIFORMES — Family: CYPRINODONTIDAE

Distinguishing characteristics: Scale and fin ray counts lower than average for the species has a reduced size, a short, deep and slab-sided body with a greatly arched and rather compressed predorsal profile, and a very long head and opercle.

Present distribution: Confined to the warm springs of Ash Meadows in the southeastern section of the Amargosa Desert, Nye County, Nevada.

Former distribution: Included at least one spring in Ash Meadows, from which this subspecies is now gone.

Status: Of concern because of limited distribution and specialized habitat.

Estimated numbers: 50 to 2,000 in each of ten springs in Ash Meadows.

Fecundity: Unknown.

Reasons for decline: Introduction of crayfish, black mollies (Poecilia latipinna), mosquitofish (Gambusia affinis), largemouth bass (Micropterus salmoides), and bullfrogs; ditching of spring outflows, drainage of marshes.

Protective measures already taken: None.

Measures proposed: Establish Jackrabbit Spring and Mexican Spring as natural area withdrawals by the Bureau of Land Management. Construct barriers to upstream dispersal of introduced fishes in the outflows of these springs and attempt to remove exotics presently established in them. Fence the area to prevent further introductions. Establish a research program that will develop information on the ecology of the species, as well as maintain constant surveillance on the effectiveness of the refugia.

Number in captivity: None.

Breeding potential in captivity: Good.

Remarks: Data provided by Dr. James E. Deacon, Nevada Southern University, Las Vegas.

References:

Miller, R. R. 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich., 68:1-155, figs. 1-5, maps 1-3, pls. 1-15.

Minckley, W. L. and J. E. Deason. 1968. Southwestern fishes and the enigma of "endangered species." Science, Vol. 159, No. 3810, p. 1424-1432.

WARM SPRING PUPFISH — Cyprinodon nevadensis pectoralis (Miller, 1948)

Order: ATHERINIFORMES — Family: CYPRINODONTIDAE

Distinguishing characteristics: A subspecies of Cyprinodon nevadensis characterized principally by an increased number of pectoral fin rays, usually 17.

Present distribution: School (formerly Lovell's) Spring and Scruggs Springs in the northern part of Ash Meadows, Nye County, Nevada.

Former distribution: Not known to be different from present distribution.

Status: Jeopardized because of its very restricted distribution and encroachment of exotic fishes.

Estimated numbers: Insufficient data.

Fecundity: Unknown.

Reasons for decline: Introduction of the predatory fish Gambusia affinis; disturbance of habitat by man.

Protective measures already taken: School Spring, which is administered by the U.S. Department of the Interior's Bureau of Land Management, was improved and fenced in 1969. In 1970, a well was drilled to serve as an additional water supply during periods of low spring water flow.

Measures proposed: Continued surveillance and investigation of suitable transplant sites.

Number in captivity: None.

Breeding potential in captivity: Unknown.

Remarks: This subspecies was previously known only from School Spring; the additional population, taken about ½ mile away at Scruggs Springs, was discovered in June 1966.

Reference:

Miller, R. R. 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich., 68:1-155, figs. 1-5, maps 1-3, pls. 1-15.

OWENS PUPFISH — Cyprinodon radiosus (Miller, 1948)

Order: ATHERINIFORMES — Family: CYPRINODONTIDAE

Distinguishing characteristics: A pupfish with dorsal fin far forward, first dorsal ray thickened, a terminal black band on caudal fin of male, and 7 pelvic rays.

Present distribution: Confined to several small areas in Fish Slough, Owens Valley, California, and to a small pond north of Big Pine, Owens Valley, California.

Former distribution: Owens Valley from the vicinity of Lone Pine, Inyo County, north to Fish Slough, Mono County, California.

Status: Thought to have been extinct since 1939, but rediscovered at one locality in July 1964.

Fecundity: Unknown.

Reasons for decline: Introduction of exotics; habitat alteration.

Protective measures already taken: A population was reestablished in the California Owens Valley Native Fish Sanctuary in 1970. Rehabilitation of the marsh by building water control structures and removing exotic fish. Classed as endangered by State of California and fully protected under State law.

Measures proposed: Continued surveillance. Establish additional populations in refuges on BLM land in Fish Slough and at Warm Springs south of Bishop, California.

Number in captivity: A few at the University of California, Los Angeles.

Culture potential in captivity: Fair.

Remarks: This species, thought to have been extinct for the past 20 years or so, still survives but urgently needs protection if it is to persist. It is one of the most distinctive (in breeding coloration, especially) of the species of Cyprinodon. Data submitted by Dr. Robert R. Miller, University of Michigan and Edwin P. Pister, California Department of Fish and Game, Bishop.

References:

Miller, R. R. 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich., No. 68:1-155, figs. 1-5, pls. 1-15, maps 1-3.

_____. 1961 Man and the changing fish fauna of the American Southwest. Pap. Mich. Acad. Sci., Arts, and Letters, 46 (1960): 365-404, fig. 1.

_____ and E. P. Pister. 1971. Management of the Owens pupfish, Cyprinodon radiosus, in Mono County, California. Trans. Amer. Fish-Soc. 100(3): 502-509.

Pister, E. P. 1970. The rare and endangered fishes of the Death Valley system--a summary of the proceedings of a symposium relating to their protection and preservation. California Department of Fish and Game (Mimeo), 23 p.

PAHRUMP KILLIFISH — Empetrichthys latos (Miller, 1948)

Order: ATHERINIFORMES — Family: CYPRINODONTIDAE

Distinguishing characteristics: A cyprinodontid without pelvic fins, with a comparatively broad mouth, usually 31 or 32 scales in the lateral series, and with conical lower pharyngeal teeth.

Present distribution: A spring-fed pool on Manse Ranch, Pahrump Valley, Nye County, Nevada.

Former distribution: Three isolated springs (each with an endemic subspecies) in Pahrump Valley.

Status: Seriously threatened with extinction.

Estimated numbers: About 100 breeding adults. The total population was about 1,300 in July 1967.

Fecundity: Good, when undisturbed.

Reasons for decline: Introduction of goldfish; modification of habitat (removal of vegetation; filling or drying of 2 springs).

Protective measures already taken: Owner of ranch is interested in conserving this species and is cooperating to keep the spring in natural condition; stock is being cultured. In 1970, a transplant was made to a spring on the lower Colorado River.

Measures proposed: Set aside other suitable habitats as refuges.

Number in captivity: Perhaps 100 at Arizona State University.

Culture potential in captivity: Good.

Remarks: Empetrichthys, a genus known only from 2 desert valleys east of Death Valley, is now threatened with extermination, since one of the species is apparently already extinct and the other one is almost gone. Data submitted by Dr. Robert R. Miller, University of Michigan.

Reference:

Miller, R. R. 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Mus. Zool. Univ. Mich., No. 68. 155 p.

BIG BEND GAMBUSIA — Gambusia gaigei (Hubbs, 1929)

Order: ATHERINIFORMES — Family: POECILIIDAE

Distinguishing characteristics: A tiny gambusia. Color pattern includes much orange and yellow pigments, especially on dorsal and anal fins. Few dark crescent-shaped marks on sides; marks never extend below lower edge of pectoral fin. Eight or nine dorsal fin rays.

Present distribution: Entire populations are confined to 2 pools in Big Bend National Park, Texas.

Former distribution: Initially collected in 1928 from Boquillas Spring, Texas. Later, the spring dried up and the type population became extinct. Discovered in 1954 in Graham Ranch Warm Springs. Apparently never widespread.

Status: In jeopardy.

Estimated numbers: About 1,000.

Fecundity: About 20 per brood.

Reasons for decline: Competition with Gambusia affinis; reduction in water supply. (Type locality dried up).

Protective measures already taken: In 1956, Graham Spring was chemically treated to eliminate G. affinis. Fifteen G. gaigei were transplanted to 3 ponds within the park but none survived. Four specimens were held over the winter at University of Texas, Austin. Two males and 1 female were returned to pools at Graham Ranch area in March 1957. From the 3 survivors the population grew in numbers. G. affinis again infested the pools and threatened the G. gaigei. Live specimens were kept at University of Texas and University of Michigan. When a new pool was developed at Graham Ranch, these specimens were introduced and now the population seems established. Specimens have been planted in Croton Springs within the park to further insure survival of the species.

Measures proposed: Continued surveillance of habitats to provide protection of water supply and against competition with G. affinis.

Number in captivity: None.

Culture potential in captivity: Can be reared successfully in captivity.

Remarks: The story of the efforts which have been made to insure the survival of this species is unique. At one time the entire population of this species was reduced to 3 individuals. Data submitted by the National Park Service.

References:

Hubbs, C. L. 1929. Studies of the fishes of the order Cyprinodontes. VIII. Gambusia gaigei, a new species from the Rio Grande. Occas. Pap. Mus. Zool. Univ. of Mich., No. 198, 11 p.

Hubbs, C. and H. J. Brodrick. 1963. Current abundance of Gambusia gaigei, and endangered fish species. The Southwestern Naturalist, Vol. 8, No. 1, p. 46-48.

CLEAR CREEK GAMBUSIA — Gambusia heterochir (Hubbs, 1957)

Order: ATHERINIFORMES — Family: POECILIIDAE

Distinguishing characteristics: Pectoral fin of male with deep indentation; no yellow pigment in dorsal or anal fins; dusky lateral stripe indistinct; "elbow" of gonopod very large.

Present distribution: Headwaters of Clear Creek, 10.4 miles west of Menard, Menard County, Texas.

Former distribution: Probably somewhat greater than present.

Status: In peril. Threatened by competition with Gambusia affinis and proposed construction of a dam, thereby altering its restricted habitat.

Estimated numbers: Fewer than 1,000.

Fecundity: Adequate when undisturbed.

Reasons for decline: See Status, above.

Protective measures already taken: None.

Measures proposed: Set aside extreme headwaters of Clear Creek as a wildlife sanctuary.

Number in captivity: None.

Culture potential in captivity: Satisfactory.

Remarks: The existence of this very localized endemic is not only threatened by its very restricted distribution and the proposed dam but also by possible genetic swamping with G. affinis, with which it hybridizes. Data submitted by Dr. Robert R. Miller, University of Michigan.

References:

Hubbs, C. 1957. Gambusia heterochir, a new poeciliid fish from Texas, with and account of its hybridization with G. affinis. Tulane Stud. Zool., Vol. 5, No. 1, p. 1-16.

_____. 1959. Population analysis of a hybrid swarm between Gambusia affinis and G. heterochir. Evolution, Vol. 13, No. 2, p. 236-246.

PECOS GAMBUSIA — Gambusia nobilis (Baird and Girard, 1853)

Order: ATHERINIFORMES — Family: POECILIIDAE

Distinguishing characteristics: A member of the nobilis species group distinguished by having a large elbow on gonopodial ray 4a and this ray equal to or exceeding ray 4p; lateral body stripe threadlike; caudal fin with dark margin; orominent dark margins on scale pockets; predorsal streak strong.

Present distribution: Now limited to spring-fed ditches about Toyahvale and to a spring near Fort Stockton, both in Texas.

Former distribution: Springs and spring-fed ditches of the Pecos River drainage in southwestern Texas and eastern New Mexico.

Status: Now extinct at the two localities (Leon and Comanche Springs, Texas) from which it was described, and greatly depleted elsewhere.

Estimated numbers: Not available.

Fecundity: Unknown.

Reasons for decline: Introduction of Gambusia affinis and other exotic predators; desiccation of habitat (e.g., Comanche Spring).

Protective measures already taken: None.

Measures proposed: Designate the cave source of Phantom Lake Spring and a suitable length of its outflow as a wildlife monument; remove exotic species and erect barriers against their re-entry.

Number in captivity: None.

Breeding potential in captivity: Unknown.

Remarks: This species is now common only in the outlet ditch of Phantom Lake Spring near Toyahvale, Texas. Data provided by Dr. Clark Hubbs, University of Texas, Austin.

Reference:

Hubbs, C. and V. G. Springer. 1957. A revision of the Gambusia nobilis species group, with description of three new species, and notes on their variation, ecology, and evolution. Texas Jour. Sci., Vol. 9, No. 3, p. 279-327.

SAN MARCOS GAMBUSIA — *Gambusia georgei* (Hubbs and Peden, 1969)

Order: ATHERINIFORMES — Family: POECILIIDAE

Distinguishing characteristics: A pale *Gambusia* with the dorsal fin orange, followed by a dark margin, as the most pronounced colors.

Present distribution: San Marcos River within 1 kilometer of U.S. Interstate 35 bridge (both sides).

Former distribution: Probably the same as at present.

Status: Occurs only in the river where the water is quiet and the aquatic vegetation is minimal. Its presence is governed by the frequency of this environment.

Estimated numbers: Fewer than 1,000.

Fecundity: Approximately 25 young per female per month.

Reasons for decline: Unknown because of lack of history.

Protective measures already taken: None.

Measures proposed: Maintenance of this segment of the stream in its natural condition.

Number in captivity: Approximately 100.

Breeding potential in captivity: Approximately 30 young per female per month.

Remarks: Data provided by Dr. Clark Hubbs, University of Texas, Austin.

Reference:

Hubbs, C. and A. E. Peden. 1969. *Gambusia* sp. nov. from San Marcos, Texas. Copeia, 1969, p. 357-364.

GILA TOPMINNOW — Poeciliopsis occidentalis occidentalis (Baird & Girard, 1854)

Order: ATHERINIFORMES — Family: POECILIIDAE

Distinguishing characteristics: Size and appearance of Gambusia affinis but no lateral streak on side, nuptial males jet black, gonopodium long and folded into a closed tube.

Present distribution: In U.S. known only from a spring area in Santa Cruz County and a spring on the San Carlos Indian Reservation, Arizona.

Former distribution: Once common in the middle and lower Gila River basin of Arizona and adjacent Sonora, Mexico.

Status: Seriously threatened with extinction. May be extinct in Mexico.

Estimated numbers: Local populations are large, but undergo marked seasonal fluctuations.

Fecundity: Excellent where undisturbed.

Reasons for decline: Introduction of exotics, especially the competitive predator Gambusia affinis; habitat destruction.

Protective measures already taken: Present owner of Monkey Spring is sympathetic with need to protect this species. The San Carlos Apache tribal officials are interested in the preservation of this subspecies.

Measures proposed: Set aside spring habitat on W. W. Kolbe Ranch (near Sonoita) as wildlife monument.

Number in captivity: 40 to 200 at Arizona State University, Tempe.

Culture potential in captivity: Not good in indoor aquaria; good in outdoor ponds.

Remarks: The original distribution of this species in the Gila River basin of Arizona has been drastically curtailed since 1926 by destruction of habitat, drying up of marshy pools, and introduction of exotics--especially Gambusia affinis. It is the only representative of the genus Poeciliopsis in the United States. This species is represented by P. o. sonoriensis in Mexico.

References:

Miller, R. R. 1961. Man and the changing fish fauna of the American Southwest. Pap. Mich. Acad. Sci., Arts, and Letters, No. 46, (1960), p. 365-404.

_____ and C. H. Lowe. 1964. An annotated check list of the fishes of Arizona. In: The Vertebrates of Arizona, C. H. Lowe, ed. Univ. Ariz. Press, Tucson, p. 133-151.

Minckley, W. L. and J. E. Deacon. 1968. Southwestern fishes and the enigma of "endangered species." Science, Vol. 159, No. 3822, p. 1424-1432.

UNARMORED THREESPINE STICKLEBACK Gasterosteus aculeatus williamsoni (Girard, 1854

Order: GASTEROSTEIFORMES Family: GASTEROSTEIDAE

Distinguishing characteristics: A threespine stickleback which usually lacks lateral plates and averages fewer than 1 plate in a random sample of 10 specimens; dorsal spines weak; pectoral and caudal fins rounded.

Present distribution: Now native only in the headwaters of the Santa Clara River in Soledad Canyon, Los Angeles County, and presumably in the Santa Maria River drainage in San Luis Obispo County, California; established by introduction in the upper part of the Mohave River, California.

Former distribution: Once abundant in the rivers that cross the Los Angeles Plain (Los Angeles, San Gabriel, Santa Ana and connecting streams) upper Santa Clara River, and tributaries of the Santa Maria River basin. Became extinct on the Los Angeles Plain between 1942 and 1961.

Status: Jeopardized because of very restricted distribution and the likely contamination of stocks established in Mohave River by genetic hybrids.

Estimated numbers: No definite data.

Fecundity: Unknown.

Reasons for decline: Introduction of the exotic predator, Gambusia affinis, and other alien species; destruction and desiccation of habitat.

Protective measures already taken: Classed endangered and protected under California State law.

Measures proposed: Protection in the headwaters of the Santa Clara River.

Number in captivity: None.

Breeding potential in captivity: Unknown, but the species has been successfully reared.

Remarks: Data provided by Dr. Robert R. Miller, University of Michigan, Ann Arbor.

References:

Miller, R. R. 1960. The type locality of Gasterosteus aculeatus williamsoni and its significance in the taxonomy of California sticklebacks. Copeia, 1960, No. 4, p. 348-350.

_____. 1961. Man and the changing fish fauna of the American Southwest. Pap. Mich. Acad. Sci., Arts, and Letters, No. 46, (1960), p. 365-404.

_____ and C. L. Hubbs. 1969. Systematics of Gasterosteus aculeatus, with particular reference to intergradation and introgression along the Pacific Coast of North America: a commentary on a recent contribution. Copeia, No. 1, (1969), p. 51-69.

ROANOKE BASS — Ambloplites cavifrons (Cope, 1869)

Order: PERCIFORMES — Family: CENTRARCHIDAE

Distinguishing characteristics: Similar to the rock bass, A. rupestria, except cheeks naked or with minute scales, generally with 1 or 2 more soft rays in the dorsal and anal fins, and with distinct dark longitudinal stripes on the body.

Present distribution: Upper Tar and Neuse River watersheds in North Carolina and possibly in the upper Roanoke River and some streams of Piedmont area, Virginia.

Former distribution: Probably similar to the present.

Status: Scarce.

Estimated numbers: Unknown, 48 were taken during a 2-year study in North Carolina. Several hundred offspring of wild fish are being reared (1969) in North Carolina State hatcheries.

Fecundity: About 26 eggs per gram of body weight; number of eggs from 4 fish varied from 3,475 to 9,600.

Reasons for decline: Roanoke bass habitat is in swift water in and near rocky rapids. Much of this type of habitat is now inundated by reservoirs and some is covered by silt.

Protective measures already taken: During the past 3 years (1968-1970), North Carolina has been studying the biology of this species. Efforts are being made to establish Fishing Creek as a wild and scenic river.

Measures proposed: Continued studies; improvement of soil conservation practices; and protection of habitat from destruction by impoundments.

Number in captivity: See estimated numbers.

Culture potential in captivity: Good. In North Carolina successful spawning has occurred in hatchery ponds. Brood fish are timid and are easily disturbed.

Remarks: Data provided by the North Carolina Wildlife Resources Commission, the Virginia Game and Inland Fisheries Commission, and Dr. Robert R. Miller, University of Michigan.

References:

Cope, E. D. 1869. On the distribution of freshwater fishes in the Allegheny Region of southwestern Virginia. Journal, Academy of Natural Sciences of Philadelphia, 2nd ser., Vol. 6, part 3, art. 5, p. 207-247.

Smith, W. B. 1968. Ecology of the Roanoke bass in North Carolina. Final Report, Job II-A, Federal Aid in Fish Restoration Project F-16-R, North Carolina Wildlife Resources Commission (Mimeo), 3 p.

_____. 1969. The biology of the Roanoke bass. Study 2. Annual Progress

Report, Federal Aid in Fish Restoration Project F-19, North Carolina Wildlife Resources Commission (Mimeo), 12 p.

SUWANNEE BASS — Micropterus notius (Bailey and Hubbs, 1949)

Order: PERCIFORMES — Family: CENTRARCHIDAE

Distinguishing characteristics: A black bass with large scales, blue underparts anteriorly, pigmentation similar to a largemouth bass, but other characters similar to a spotted bass.

Present distribution: Ichtucknee Springs, Columbia County, and adjacent springs in northern Florida and Ochlocknee River, Florida.

Former distribution: The same.

Status: Range very restricted.

Estimated numbers: Unknown.

Fecundity: Unknown.

Reasons for decline: No data that this species has declined.

Protective measures already taken: The State of Florida has acquired Ichtucknee Springs.

Measures proposed: Establishment of this species in other suitable waters.

Number in captivity: A few young and adults are maintained in experimental ponds at Auburn University, Alabama.

Culture potential in captivity: Suwannee bass spawned in the Auburn University ponds during the spring of 1970.

Remarks: Spraying of herbicides or insecticides might easily eliminate a species so restricted geographically as this appears to be. Data submitted by Dr. Robert R. Miller, University of Michigan, Florida Division of Game and Fresh Water Fish, and the Alabama Cooperative Fishery Unit, Auburn University.

Reference:

Bailey, R. M. and C. L. Hubbs. 1949. The black basses (Micropterus) of Florida, with description of a new species. Occ. Pap. Mus. Zool. Univ. Mich., No. 516, 40 p.

Ramsey, J. S. 1973. (Personal communication - letter to Stephen H. Taub dated January 24, 1973).

SHARPHEAD DARTER — Etheostoma acuticeps (Bailey, 1959)

Order: PERCIFORMES — Family: PERCIDAE

Significance: This species is of interest to ichthyologists as only six specimens have ever been collected.

Distinguishing characteristics: This species has an extremely sharply pointed snout and head and a short deep body. The head and nape are scaleless, blue-green and pale green fins, and dark horizontal bands between the scale rows.

Present distribution: The known specimens were collected in 1947 and 1949 in the South Fork of the Holston River, altitude about 1,490 feet, approximately one-half mile above the South Holston Dam (during construction, hence prior to impoundment), seven miles southeast of Bristol, Sullivan County, Tennessee.

Former distribution: Unknown.

Status: Extremely jeopardized and probably extinct.

Estimated numbers: Unknown. None taken since 1949.

Fecundity: Unknown.

Reasons for decline: Flooding of the habitat by the impoundment of the river behind the South Holston Dam.

Measures proposed: Continued search for the species elsewhere.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. William J. Richards, Bureau of Commercial Fisheries, Washington, D.C. Dr. R. R. Miller reports (1967) species extinct.

Reference:

Baily, R. M. 1959. Etheostoma acuticeps, a new darter from the Tennessee River system, with remarks on the subgenus Nothonotus, Occ. Pap. Mus. Zool. Univ. Mich. (603) pp. 1-11.

FOUNTAIN DARTER — Etheostoma fonticola (Jordan and Gilbert, 1886)

Order: PERCIFORMES — Family: PERCIDAE

Distinguishing characteristics: A small dark darter, usually with only one anal spine; back with about 8 indistinct saddles; midsides with a series of short horizontal lines.

Present distribution: Confined to Comal and San Marcos Springs and their outflows in Hays and Comal Counties, Texas.

Former distribution: Not known to be different from present distribution.

Status: In a precarious condition because of restricted distribution and habitat modification.

Estimated numbers: 1,000.

Fecundity: Unknown.

Reasons for decline: Channelization of the outlet of San Marcos Spring.

Protective measures already taken: None.

Measures proposed: Protection of habitat in the outflow of San Marcos Spring.

Number in captivity: None.

Breeding potential in captivity: Unknown.

Remarks: Data provided by Dr. Clark Hubbs, University of Texas, Austin.

Reference:

Hubbs, C. 1957. Distributional patterns of Texas freshwater fishes. S.W. Nat., 2 (2-3):89-104, figs. 1-2.

NIANGUA DARTER — Etheostoma nianguae (Gilbert and Meek, 1887)

Order: PERCIFORMES — Family: PERCIDAE

Distinguishing characteristics: Palatine teeth present, spinous dorsal fin with orange or red marginal or submarginal band, lateral line almost complete, scales 74-80 along body, with 2 discrete, jet-black spots on the base of the caudal fin.

Present distribution: Big Tavern Creek, Niangua River and the Maries River of the Osage River drainage in Missouri.

Former distribution: Same as present.

Status: Very uncommon.

Estimated numbers: Probably less than 1,000.

Fecundity: No data.

Reasons for decline: Habitat reduced by construction of the Lake of the Ozarks.

Protective measures already taken: None.

Measures proposed: Surveillance of plans for reservoir construction and restriction of pesticide spraying near present habitat.

Number in captivity: No data.

Remarks: Data submitted by the Missouri Conservation Commission.

Reference:

Gilbert, C. H. 1888. Descriptions of new and little known etheostomids. Proc. U.S. Nat. Mus. 1887, Vol. 10, p. 47-64.

WATERCRESS DARTER — Etheostoma nuchale (Howell and Caldwell, 1965)

Order: PERCIFORMES — Family: PERCIDAE

Distinguishing characteristics: A small, robust darter species, the largest known just over 2 inches in total length. Breeding males with red-orange and blue fins and red-orange on lower part of body. Lateral-line scales 35 to 42; lateral line incomplete, 12 to 24 pored scales.

Present distribution: Known only from Glen Spring at Bessemer, Jefferson County, Alabama, along county highway 20 (Black Warrior River drainage).

Former distribution: Probably was present in an adjacent spring destroyed by highway construction.

Status: Jeopardized. Proposed widening of Highway 20 would destroy habitat. Lowering trend in water table may dry spring in a severe drought year.

Estimated numbers: Probably less than 400.

Fecundity: Adequate if undisturbed. Breeding probably occurs continuously from March through July.

Reason for decline: Alteration of springs for public or industrial use.

Protective measures already taken: Owner of spring property apprised of uniqueness of form, sympathetic to protection. An attempt at introduction was made in a more protected spring in the vicinity.

Measures proposed: Determine willingness of Jefferson County highway officials to conserve Glen Spring. Further attempt at introduction in nearby suitable habitat.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Observations of living specimens suggest high dependence on association with watercress, Nasturtium officionale. Submitted by Dr. John S. Ramsey, Bureau of Sport Fisheries and Wildlife, Auburn University, Alabama, with recent information provided by Dr. W. Mike Howell.

Reference:

Howell, W. M. and R. D. Caldwell. 1965. Etheostoma (Oligocephalus) nuchale, a new darter from a limestone spring in Alabama. Tulane Stud. Zool., Vol. 12, No. 4, p. 101-108.

OKALOOSA DARTER — Etheostoma okaloosae (Fowler, 1941)

Order: PERCIFORMES — Family: PERCIDAE

Distinguishing characteristics: A small, medium to dark brown darter lacking breeding tubercles. Lateral line moderately complete and slightly arched. A dark humeral spot present. Lacking conspicuous red spots characteristic of the other member of the subgenus Villora, Etheostoma edwini.

Present distribution: Five small streams which originate on Eglin Air Force Base and empty into the northwest corner of Choctawhatchee Bay, Okaloosa County, Florida.

Former distribution: Same as above, but apparently occurred at more sites on the five creeks.

Status: Deteriorating from habitat destruction and possible competition from Etheostoma edwini.

Fecundity: Unknown.

Estimated numbers: Probably less than 1,500.

Reasons for decline: Road construction and siltation from forest clearing are destroying the habitat in one stream. Another has a dam built on it which has apparently eliminated the population above it. A dam had been proposed for a third stream, one of the two largest in the range.

Protective measures already taken: Recognized as an endangered species by State of Florida.

Measures proposed: Halt further dam construction and siltation.

Number in captivity: Unknown.

Breeding potential in captivity: Little known except mature adults placed in aquaria spawned.

Remarks: The streams in which Etheostoma okaloosae is found are very close to or in the city limits of two moderate size towns; therefore, in addition to dam and road construction, pollution may be exerting some stress on present population. A study is being made at the present time to determine these effects. Data submitted by Maurice F. Mettee, University of Alabama.

References:

Collette, B. B. and R. W. Yerger. 1962. The American percid fishes of the subgenus Villora. Tulane Studies in Zoology, Vol. 9, No. 4, p. 213-230.

Fowler, H. W. 1941. A collection of freshwater fishes obtained in Florida, 1939-40, by Francis Harper. Proc. Acad. Nat. Sci. Philadelphia, Vol. 92, p. 227-244.

Mettee, M. F. 1970. A survey of the fishes of the Choctawhatchee Bay drainage in Alabama and Florida. Unpublished master's thesis. University of Alabama. 102 p.

MARYLAND DARTER — Etheostoma sellare (Radcliffe and Welsh, 1912)

Order: PERCIFORMES — Family: PERCIDAE

Significance: This species is of interest to ichthyologists as only a few specimens have been collected and it is known to live only in 1 or 2 small Maryland streams.

Distinguishing characteristics: A small fish of from 1 to 2 inches in total length. Reddish-brown with 4 black saddle markings and a black spot behind the eye. Moderately pointed snout, separate gill membranes, no scales on the belly, breast, cheek and nape.

Present distribution: Found in Swan Creek, a small stream from 3 to 15 feet wide, near Havre de Grace, Maryland and another nearby stream.

Former distribution: Not known.

Status: Precarious condition. Two specimens were collected in 1912, 1 was taken in 1962, and a few were collected in 1964.

Estimated numbers: Not known.

Fecundity: Not known.

Reasons for decline: There are no data to support a statement that they have declined.

Protective measures already taken: Biologists have been requested not to disturb the habitat.

Measures proposed: The habitat should not be disturbed.

Number in captivity: None. There are 2 preserved specimens in the U.S. National Museum and 1 in the Cornell University fish collection.

Culture potential in captivity: Unknown.

Remarks: The present known habitat is near an area of commercial and residential development.

References:

Knapp, L. S., W. J. Richards, R. V. Miller, and N. R. Foster. 1963. Rediscovery of the percid fish Etheostoma sellare (Radcliffe and Welsh). Copeia, p. 455.

Radcliffe, L. and W. W. Welsh. 1914. Description of a new darter from Maryland. Bull. U.S. Bur. Fisheries, Vol. 32, p. 29-32.

TRISPOT DARTER — Etheostoma trisella (Bailey and Richards, 1963)

Order: PERCIFORMES — Family: PERCIDAE

Significance: This species is of interest to ichthyologists as one specimen was collected in 1947, one in 1954, and several hundred were found in 1969.

Distinguishing characteristics: The lone specimen taken in 1947 was 1½ inches long and had three very distinct saddles or spots on its back. It is one of the few darters with only one anal spine.

Present distribution: In a few streams in the Coosa River drainage on the Talladega (Alabama) and Chattahoochee (Georgia) National Forests.

Former distribution: Unknown.

Status: Scarce.

Estimated numbers: Several hundred.

Fecundity: Not known.

Reasons for decline: Some of the habitat was flooded by Weiss Lake, a 45-square-mile impoundment formed behind Weiss Dam, which is operated by the Alabama Power Company.

Protective measures already taken: Collection of specimens has been restricted.

Measures proposed: Preservation of the national forest streams.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. William J. Richards, Bureau of Commercial Fisheries, Washington, D.C. and Dr. John S. Ramsey, Bureau of Sport Fisheries and Wildlife, Auburn University, Alabama.

References:

Bailey, R. M. and W. J. Richards. 1963. Status of Poecilichthys hopkinsi Fowler and Etheostoma trisella, new species, percid fishes from Alabama, Georgia, and South Carolina. Occ. Pap. Mus. Zool. Univ. Mich. (630), p. 1-21.

Gilbert, C. H. 1888. Description of new and little known etheostomids. Proc. U.S. Nat. Mus. (1887), Vol. 10, p. 47-64.

_____. 1891. Report of exploration made in Alabama during 1889, with notes on the fishes of the Tennessee, Alabama, and Escambia Rivers. Bull. U.S. Fish Comm. (1889), p. 143-159.

TUSCUMBIA DARTER — Etheostoma tuscumbia (Gilbert and Swain, 1887)

Order: PERCIFORMES — Family: PERCIDAE

Significance: This species is of interest to ichthyologists since it only lives in springs along the Tennessee River.

Distinguishing characteristics: This species is quite small, 1 to 2 inches long, and dull brown in color. The head is scaly and it generally has only 1 anal spine and an incomplete supratemporal canal.

Present distribution: In 6 springs along the southern bend of the Tennessee River in Alabama.

Former distribution: Along the Tennessee River Valley in Alabama and Tennessee.

Status: Vulnerable.

Estimated numbers: Unknown. 138 specimens were collected from springs in Alabama during 1963-1967.

Fecundity: Unknown.

Reason for decline: Flooding of its habitat by the impoundment of the Tennessee River and destruction of aquatic vegetation in springs.

Measures proposed: Preserve present habitat.

Number in captivity: None.

Culture potential in captivity: Unknown.

Remarks: Data submitted by Dr. William J. Richards, Bureau of Commercial Fisheries, Washington, D.C. and James G. Armstrong III, Jackson, Wyoming.

References:

Armstrong, J. G. 1967. A study of the spring dwelling fishes of the southern bend of the Tennessee River. Thesis, M.S., Univ. Ala., 60 p.

Bailey, R. M. and W. J. Richards. 1963. Status of Poecilichthys hopkinsi Fowler and Etheostoma trisella, new species, percid fishes from Alabama, Georgia, and South Carolina. Occ. Pap. Mus. Zool. Univ. Mich. (630), p. 1-21.

Gilbert, C. H. 1888. Descriptions of new and little known etheostomids. Proc. U.S. Nat. Mus. (1887), Vol. 10, p. 47-64.

_____. 1891. Report of the exploration made in Alabama during 1889, with notes on the fishes of the Tennessee, Alabama and Escambia Rivers. Bull. U.S. Fish Comm. (1889), p. 143-159.

BLUE PIKE — Stizostedion vitreum glaucum (Hubbs, 1926)

Order: PERCIFORMES — Family: PERCIDAE

Significance: The blue pike was one of the more important commercial species of Lake Erie where the annual catch frequently exceeded 20 million pounds and was 19.7 million pounds in 1955 before its recent decline and near disappearance. It was also prominent in the commercial fishery in Lake Ontario but the annual catch never exceeded 500,000 pounds.

Distinguishing characteristics: Pelvic fins whitish blue and body bluish gray. Otherwise much like the yellow pike or walleye but with the eyes larger and closer together and without brassy or yellow mottlings.

Present distribution: Very uncommon in the deeper and cooler areas of Lake Erie and possibly Lake Ontario.

Former distribution: The same.

Status: Threatened. Although a few hundred pounds of blue pike have been listed in the catch of commercial fishermen in recent years, biologists have found that these were mostly small yellow pike.

Estimated numbers: Very few.

Fecundity: Spawned in moderately deep areas in early summer.

Reasons for decline: The physical, chemical, and biological environment in Lakes Erie and Ontario have deteriorated measurably in recent years creating conditions that seem to be unfavorable for survival of eggs and young. Severe oxygen depletion in the blue pike spawning area in central Lake Erie shortly after the spawning period is an obvious contributing factor.

Protective measures already taken: In 1969, a pair of Lake Erie Stizostedion, believed to be blue pike, were spawned at the Pennsylvania Fish Commission's Linesville Fish Culture Station. About 9,000 of the fry were transferred to the Gavins Point National Fish Hatchery at Yankton, South Dakota. Some of the fingerlings were stocked in an isolated lake in northern Minnesota.

Measures proposed: Additional spawning stock should be obtained for culture.

Number in captivity: Some at Linesville Fish Culture Station, Pennsylvania, and Gavins Point National Fish Hatchery, South Dakota.

Culture potential in captivity: Good.

Remarks: Data submitted by Dr. Stanford H. Smith, Bureau of Commercial Fisheries, Ann Arbor, Michigan and Region 3, Bureau of Sport Fisheries and Wildlife, Twin Cities, Minnesota.

References:

Hubbs, C. L. and K. F. Lagler. 1964. Fishes of the Great Lakes region. University of Michigan Press, 213 p.

Miller (re Applegate) says none taken since 1964.

Trautman, M. B. 1957. The fishes of Ohio. Ohio State University Press, 683 p.

PYGMY SCULPIN — Cottus pygmaeus (Williams, 1968)

Order: PERCIFORMES — Family: COTTIDAE

Distinguishing characteristics: A dark-colored sculpin attaining a maximum total length of 1 3/4 inches. Spinous and soft dorsal fin portions broadly joined. Lateral line incomplete with 20 to 24 pores.

Present distribution: Known only from Coldwater Spring and effluent 5.7 miles west of Anniston, Calhoun County, Alabama (Coosa River drainage).

Former distribution: Probably occurred farther downstream in Coldwater Creek, limited presently to above confluence with polluted tributary about 500 feet below spring.

Status: Vulnerable. Could be exterminated if habitat altered through further impoundment or vegetation control measures.

Estimated numbers: About 1,000.

Fecundity: Breeds at least from May through September, probably spawns all year. Total ovarian eggs number 30 to 43.

Reasons for decline: Pollution in Coldwater Creek.

Protective measures already taken: Coldwater Spring is the municipal water supply for Anniston, Alabama, and is fenced against intruders.

Measures proposed: Advise Anniston water supply officials of uniqueness of the species. Determine vulnerability to vegetation control measures. Monitor water supply development plans for Coldwater spring.

Number in captivity: None at present.

Culture potential in captivity: Difficult to maintain. Twenty specimens were kept for several months in a constant-temperature stream aquarium at Auburn University. They could not be trained to accept any but living food. Spawning occurred, but the eggs were infertile. All succumbed apparently to changing water quality.

Remarks: Aquatic vegetation control and enclosure or further impoundment are the chief threats to well-being. Israeli carp introduced to browse on vegetation appear to have left the spring. Growing demand for water in Anniston already uses about half of average spring flow. Data supplied by Dr. John S. Ramsey.

Reference:

Williams, J. D. 1968. A new species of sculpin, Cottus pygmaeus, from a spring in the Alabama River basin. Copeia, 1968 (2): 334-342.

PERIPHERAL FISHES

A peripheral species or subspecies is one whose occurrence in the United States is at the edge of its natural range and which is threatened with extinction within the United States although not in its range as a whole. Special attention is necessary to assure retention in our Nation's fauna.

Mexican Stoneroller, Campostoma ornatum
Big Bend region of Rio Grande in Texas and in limited range in Arizona; common in Mexico.
Suggested by National Park Service.

Sonora Chub, Gila ditaenia
Rio de la Concepcion in Mexico; Sycamore Canyon, Coronado National Forest, in southern Arizona.
Suggested by Dr. Loye Miller, University of California.

Chihuahua Shiner, Notropis chihuahua
Rio Grand drainage in Texas and Mexico.
Suggested by National Park Service.

Rio Grande Darter, Etheostoma grahami
Tributaries of the Rio Grande in Mexico and Texas.
Suggested by Dr. Clark Hubbs, University of Texas.

STATUS-UNDETERMINED FISHES

A status-undetermined species or subspecies is one that has been suggested as possibly threatened with extinction, but about which there is not enough information to determine its status. More information is needed.

Pallid Sturgeon, Scaphirhynchus albus
Mississippi Valley.
Suggested by Dr. Frank B. Cross, University of Kansas.

Shortnose Cisco, Coregonus reighardi
Lake Superior, Lake Michigan, and Lake Ontario.
Suggested by New York Conservation Department.

Colorado Cutthroat Trout, Salmo clarki pleuriticus
Headwaters of the Colorado River.
Suggested by Dr. Harold K. Hagen, Colorado State Univ. & Utah Dept. of Fish & Game.

Montana Westslope Cutthroat Trout, Salmo clarki subspecies
Flathead River Drainage, Montana.

Utah Cutthroat Trout, Salmo clarki utah
Utah, west of Wasatch Mountains, and White Pine County in Nevada.
Suggested by Utah Department of Fish and Game.

Yellowfin Cutthroat Trout, Salmo clarki macdonaldi
Twin Lakes, Colorado.

Alvord Basin Cutthroat Trout, Salmo clarki subsp.
Willow Creek drainage, Alvord Basin, Harvey County, Oregon.
Suggested by Dr. Robert J. Behnke, Bur. Sport Fisheries & Wildlife, Colo. State Univ.

Eagle Lake Rainbow Trout, Salmo gairdneri aquilarum
Eagle Lake and other waters in Lassen and Modoc Counties, California.
Suggested by California Department of Fish and Game.

Yaqui Chub, Gila purpurea
San Bernardino Creek of Yaqui River in Arizona.
Suggested by J. Clark Salyer II.

White River Spinedace, Lepidomeda albivallis, Miller and Hubbs, 1960.
White River in White Pine and Nye Counties, Nevada.
Suggested by Dr. James E. Deacon, Nevada Southern University, Las Vegas, Nevada.

Spikedace, Meda fulgida
Salt, upper Gila and San Pedro Rivers, also Arivaipa Creek (New Mexico).
Suggested by W. L. Minckley.

Kanawha Minnow, Phenacobius teretulus
Kanawha River in West Virginia, Virginia, and North Carolina.
Suggested by Dr. Edward C. Kinney, Bureau Sport Fisheries & Wildlife, Wash., D.C.

Lost River Sucker, Catostomus luxatus
Klamath Lakes in Oregon and California.
Suggested by California Department of Fish and Game.

Shortnose Sucker, Chasmistes brevirostes, Cope, 1879.
COPCO reservoir (Klamath River and upper Lost River, above Clear Lake, Calif.).
Suggested by Dr. R. R. Miller, Ann Arbor, Michigan.

June Sucker, Chasmistes liorus.
Utah Lake, Utah.

Rustyside Sucker, Moxostoma hamiltoni.
Roanoke River in Virginia.
Suggested by Virginia Commission of Game and Inland Fisheries.

Humpback Sucker, Xyrauchen texanus.
Colorado System in Arizona and California.
Suggested by California Department of Fish and Game and
Dr. Harold K. Hagen, Colorado State University.

Widemouth Blindcat, Satan eurystomus
Artesian wells at San Antonio, Texas.
Suggested by Texas Parks and Wildlife Department.

Toothless Blindcat, Trogloglanis pattersoni
Artesian wells at San Antonio, Texas.
Suggested by Texas Parks and Wildlife Department.

Shoshone Pupfish, Cyprinodon nevadensis shoshone
Found only in a few springs near Shoshone, California.
This subspecies may be extinct. Further studies are being made to determine its status.

Waccamaw Killifish, Fundulus waccamensis
Lake Waccamaw in North Carolina.
Suggested by Dr. Frank J. Schwartz, University of Maryland.

Waccamaw Silverside, Menidia extensa
Lake Waccamaw in North Carolina.
Suggested by Dr. Frank J. Schwartz, University of Maryland.

Sacramento Perch, Archoplites interruptus
Lakes in California, Nebraska, Arizona, Nevada, and Utah.
Suggested by California Department of Fish and Game and J. Clark Salyer II.

Guadalupe Bass, Micropterus treculi
Colorado River, San Marcos River, and Guadalupe River, and western tributaries of the Brazos River in Texas.
Suggested by Dr. Clark Hubbs, University of Texas.

Blenny Darter, Etheostoma blennius
Tennessee River System in Tennessee and Alabama.

Tuckasegee Darter, Etheostoma gutselli
Tennessee River System in Tennessee and North Carolina.

Waccamaw Darter, Etheostoma perlongum
Lake Waccamaw in North Carolina.
Suggested by Dr. Frank J. Swartz, University of Maryland.

Backwater Darter, Etheostoma zoniferum
Catoma and Big Swamp Creeks near Montgomery, Alabama.

Tangerine Darter, Percina aurantiaca
Tennessee River System in Tennessee, North Carolina, and Virginia.
Suggested by Dr. William J. Richards, U.S. Bureau of Commercial Fisheries.

Freckled Darter, Percina lenticula
Alabama River System in Alabama and Georgia.
Suggested by Dr. William J. Richards, U.S. Bureau of Commercial Fisheries.

Sharpnose Darter, Percina oxyrhyncha
Mountain streams of Kanawha River drainage in Virginia.

Leopard Darter, Percina pantherina
Little River System in Oklahoma and Arkansas.
Suggested by Dr. William J. Richards, U.S. Bureau of Commercial Fisheries.

Olive Darter, Percina squamata
Tennessee River System in Tennessee and North Carolina.

Tidewater Goby, Eucyclogobious newberryi
Corte Madera Creek in California.
Suggested by California Department of Fish and Game.

Rough Sculpin, Cottus asperrimus
Few tributaries of Pit River in Shasta and Modoc Counties, California.
Suggested by California Department of Fish and Game.

Threatened

REPTILES AND AMPHIBIANS

of the United States

Species or subspecies of reptiles and amphibians that are so few in number or so threatened by present circumstances, as to be in danger of extinction.

Arranged, one sheet for each species or subspecies, in systematic order.

SANTA CRUZ LONG-TOED SALAMANDER — Ambystoma macrodactylum croceum (Russell and Anderson)

Order: CAUDATA — Family: AMBYSTOMIDAE

Distinguishing characteristics: A long-toed ambystomid salamander, black above with metallic orange or gold spots down the middle of the back; belly sooty.

Present distribution: Known from only two localities in Santa Cruz County California: Valencia Lagoon near Aptos, and Ellicott Pond 4-miles west of Watsonville.

Former distribution: Same.

Status: On the verge of total extermination. Listed as endangered by California Dept. of Fish and Game. In 1969 construction of a four-lane highway, associated excavation, and construction of a "Borrow Ditch" at Valencia Lagoon drastically reduced the size of this breeding area. Proposed trailer park threatens Ellicott Pond.

Estimated numbers: At Ellicott Pond, 6,000 to 8,000; at Valencia, unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: A post-pluvial remnant, threatened by subdivision and other land developments.

Protective measures already taken: At Valencia, California, Department of Highways has constructed a salamander pond (250 x 50 feet) to restore part of disturbed habitat. Fully protected by California law.

Measures proposed: Establishment of a wildlife refuge or ecological reserve at Valencia Lagoon and Ellicott Pond including sufficient adjacent land to protect upland habitat. Both are also waterfowl habitat.

Number in captivity: None.

Breeding potential in captivity: Successful courtship and insemination has occurred. It may be possible to rear the animals in captivity.

Remarks: Submitted by Robert Stebbins.

References:

Bury, R. B. 1972. Status report on California's threatened amphibians and reptiles. Inland Fisheries Administrative Report 72-2. California Dept. of Fish & Game.

_____ and S. B. Ruth. 1972. Santa Cruz long-toed salamander: Survival in doubt. Herpetol. Rev. 4(1):20-22.

Leach, H. R. and L. D. Fisk. 1972. At the crossroads--a report on California's endangered and rare fish and wildlife. California Dept. of Fish & Game.

Lostetter, C. Report of field trip to area of species occurrence, October 27, 1969.

Marlow, R. W. (Pers. Comm., 1972).

Russell, R. W. and J. D. Anderson. 1956. Herpetologica, Vol. 12, pp. 137-140.

Ruth, S. B. (Pers. Comm., 1972).

Wallow, R. W. and S. B. Ruth. 1972. Administrative Reports. Calif. Dept. Fish & Game.

DESERT SLENDER SALAMANDER — Batrachoseps aridus (Brame)

Order: CAUDATA — Family: PLETHODONTIDAE

Distinguishing characteristics: A small, slim land salamander, differing from all other members of its genus by its distinctive ventral coloration consisting of blackish maroon on belly and throat area which is sharply contrasted with the flesh-colored ventral side of the tail (from original description).

Present distribution: Known only from about an acre of land in the immediate vicinity of the type locality, which is in Hidden Palm Canyon, a branch of Deep Canyon, at the northwest end of the Santa Rosa Mountains, Riverside County, California. They live under limestone sheeting on north and west facing walls of the canyon in summer and can also be found under rock talus during rest of year.

Former distribution: Since the species is very recently described there is no information about its earlier distribution.

Status: In peril. Listed as endangered by California Dept. of Fish and Game.

Estimated numbers: Brame (1970) estimates the total population at fewer than 500.

Breeding rate in wild: Unknown.

Reasons for decline: No demonstrable decline has as yet taken place. The restriction in habitat to the limestone sheeting and the talus slopes makes the species particularly vulnerable to over-collecting by zoologists. Destruction of the limestone cover would result in extinction of the species.

Protective measures taken: Fully protected under California law.

Protective measures proposed: The California Department of Game and Fish is attempting to acquire the type locality for an ecological reserve. Dr. Lloyd Tevis, the University of California, has recommended the locality be listed on the inventory of places in the low desert which need to be preserved, as prepared by the California Natural Areas Coordinating Council.

Number in captivity: None.

Breeding potential in captivity: Unknown, probably slight or none.

References:

Bury, R. B. 1972. Status report on California's threatened amphibians and reptiles. Inland Fisheries Administrative Report 72-2. California Dept. of Fish & Game.

Brame, A. H. 1970. Contributions in science, Los Angeles County Museum, No. 13.

_____. 1970. Pasadena, California (pers. comm.).

Leach, H. R. and L. D. Fisk. 1972. At the crossroads--a report on California's endangered and rare fish and wildlife. California Dept. of Fish and Game.

Tevis, L. 1970. Deep Canyon Desert Research Center, California (pers. comm.).

TEHACHAPI SLENDER SALAMANDER — Batrachoseps stebbinsi (Brame and Murray)

Order: CAUDATA — Family: PLETHODONTIDAE

Distinguishing characteristics: An elongate, slim bodied land salamander, about 55 mm. in body length, with long limbs, large feet, and extensive webbing between toes; dorsal color consists of dark red, brick red, light or dark brown, or light beige patches and blotches, sometimes forming an indistinct band (from original description, published in 1968).

Present distribution: Known from a few localities in Kern County, California, including the type locality: 10.8 miles east of Caliente Store on Caliente Creek Road, Piute Mountains; from 6.3 miles southeast of Keene Post Office on Highway 58, Tehachapi Mountains; and from several localities along the Caliente Creek Road (Brame, 1971). Found under large rocks and logs (Brame and Murray, 1968).

Former distribution: Since the species is very recently described, there is no information about its earlier distribution.

Status: Very uncommon. California Fish and Game Department lists as rare.

Estimated numbers: Only about 75 specimens have ever been seen. Brame (in litt., 1970) estimates the total population at fewer than 3,000.

Breeding rate in wild: Unknown.

Reasons for decline: No demonstrable decline has as yet taken place. In a species with such narrow tolerance limits in its habitat, any decline could be disastrous.

Protective measures taken: Protected by California law.

Protective measures proposed: Establish ecological reserves to protect critical areas.

Number in captivity: None.

Breeding potential in captivity: Unknown.

References:

Brame, A. H., and K. F. Murray. 1968. Bulletin of the Los Angeles County Museum of Natural History, Science: No. 4.

Brame, A. H. 1970, 1971. Pasadena, California (pers. comms.).

Bury, R. B. 1972. Status report on California's threatened amphibians and reptiles. Inland Fisheries Administrative Report 72-2. California Dept. of Fish & Game.

Leach, H. R. and L. D. Fisk. 1972. At the crossroads--a report on California's endangered and rare fish and wildlife. California Dept. of Fish & Game.

LIMESTONE SALAMANDER — Hydromantes brunus (Gorman)

Order: CAUDATA — Family: PLETHODONTIDAE

Distinguishing characteristics: A lungless, terrestrial salamander; uniformly brown above and pale below; underside of tail yellowish (Stebbins, 1966).

Present distribution: Vicinity of Briceburg, Mariposa County, California, at confluence of Bear Creek and Merced River and along tributaries of Bear Creek, at altitudes of 1,200 to 2,500 feet. Recently located about 15 miles south of Briceburg (R. Bruce Bury, Pers. Comm., 1972).

Former distribution: Probably same as at present.

Status: Exists only in several small populations, and will be in peril if limestone in area is quarried. Listed as rare by California Dept. of Fish & Game.

Estimated numbers: Currently known only from several localities within range given above, with probably not many more than 50 adult individuals in any single population (Stebbins, 1967).

Breeding rate in the wild: Unknown.

Reasons for decline: Not currently on decline, but the species is found in a region which might become a commercial source of limestone, and its habitat is solely that of crevices in limestone sliffs and ledges and in limestone talus. Highway construction could threaten some populations.

Protective measures already taken: Protected by California law.

Measures proposed: Establishment of protected areas within range of species where quarrying would not be permitted; avoidance of undue disturbance of habitat. Establish ecological reserve proposed by California Dept. of Fish & Game.

Number in captivity: Probably none.

Breeding potential in captivity: Probably none; the species must be protected in its native habitat.

References:

Bury, R. B. 1972. Status report on California's threatened amphibians and reptiles. Inland Fisheries Administrative Report 72-2. California Dept. of Fish & Game.

Gorman, J. 1954. Herpetologica, Vol. 10, pp. 153-158.

_____. 1964. Hydromantes brunus, H. platycephalus, and H. shastae. Catalogue of American amphibian reptiles, 11.1 - 11.2.

Leach, H. R. and L. D. Fisk. 1972. At the crossroads--a report on California's endangered and rare fish and wildlife. California Dept. of Fish & Game.

Stebbins, R. C. 1954. Amphibians and reptiles of western North America, pp. 534-535.

SHASTA SALAMANDER — Hydromantes shastae (Gorman and Camp)

Order: CAUDATA — Family: PLETHODONTIDAE

Distinguishing characteristics: A cave associated salamander with webbed toes, relatively long limbs, and a somewhat flattened body; color above is gray-green, tan or reddish with white or silvery flecks on a dark gray venter; adults are 1-1/2 to 2-1/2 inches in snout-vent length.

Present distribution: Known only from four areas in the limestone region north of Lake Shasta in north-central California; near McCloud River U.S. F.S. Station, southwest tip of McCloud limestone formation, Low Pass Creek, and Brock Mountain (see map in Bury et al, 1969).

Former distribution: Probably the same as at present.

Status: Scarce at known localities.

Estimated numbers: Total number unknown, but fewer than 150 specimens have been collected.

Breeding rate in the wild: Gorman reported two clutches of nine eggs each that were found in caves on Brock Mountain; the species probably breeds yearly, with egg deposition in early fall.

Reasons for decline: The species is found in very few places, all of which are threatened by possible exploitation of limestone outcrops for commercial utilization. It is also in danger through decimation of the populations by both amateur and professional biologists, due to its rarity.

Protective measures already taken: All known localities are within the Shasta-Trinity National Forest Recreation Area, where logging and mining operations are regulated. Protected by California State law.

Measures proposed: The establishment of a wildlife monument or wildlife refuge for the McCloud and Gray Rocks limestone area, which includes all of the populations of the salamander, would not only protect this species, but also provide protection for a variety of plants and animals endemic to these Triassic and Permian limestone habitats.

Number in captivity: Very few, if any.

Breeding potential in captivity: Unknown.

Remarks: The Shasta salamander was earlier proposed for consideration by Dr. Frederick Gehlbach and by Dr. Robert C. Stebbins, but it was placed as a status undetermined species until additional information became available. Detailed information submitted by R. B. Bury.

References:

Bury, R. B., G. M. Fellers, and S. B. Ruth. 1969. Journal Herpetology, Vol. 3, pp. 157-161.

Gorman, J. and C. L. Camp. 1953. Copeia. pp. 39-43.

Gorman, J. 1956. Herpetologica. pp. 249-259.

Stebbins, R. C. 1966. A field guide to western reptiles and amphibians, Houghton Mifflin Co.

JEMEZ MOUNTAIN SALAMANDER — Plethodon neomexicanus (Stebbins and Reimer)

Order: CAUDATA — Family: PLETHODONTIDAE

Distinguishing characteristics: A slender, elongate, terrestrial salamander, with 19 costal grooves and a single phalanx in the fifth hind toe; brownish dorsally, with golden flecking, light ventrally.

Present distribution: Known only from a very small area in the Jemez Mountains, New Mexico. It has been collected at a total of seven places (Reagan, 1972).

Former distribution: Within historical times, probably about as at present, but certainly more widely spread during Pleistocene.

Status: Very uncommon.

Estimated numbers: Probably several thousand individuals. It can be collected comparatively easily in suitable habitat.

Breeding rate in the wild: Clutch size is 5 to 12 (Reagan, 1972). Eggs are deposited underground among rocks (Reagan, 1972).

Reasons for decline: Probably no decline in historical time; the retreat of the Arcto-Tertiary forest in the Pleistocene resulted in the isolation of the species in the Jemez Mountains (Blair, 1958).

Protective measures already taken: None.

Measures proposed: The salamander lives on land under the control of either the U.S. Forest Service or the Baca Land and Cattle Corporation. Both should be encouraged to remain aware of this diminutive inhabitant of their property. A Research Natural Area should be established on Federal land to protect parts of its habitat. Many specimens are now available in collections, and collectors should leave it alone.

Number in captivity: None, insofar as known.

Breeding potential in captivity: Probably none.

Remarks: The species was first suggested by H. J. McKirdy, and listed as "status unknown" in earlier Red Books. Douglas Reagan has provided sufficient documentation to permit identification of its status.

References:

Blair, W. F. 1958. In Hubbs. C. Zoogeography. AAAS Publ. 51.

Highton, R. 1962. Florida State Museum. Bull. Vol. 6.

Reagan, D. P. 1972. Ecology and distribution of the Jemez Mountains salamander, Plethodon neomexicana. Copeia, 1972(3): 486-492.

Stebbins, R. C. and W. J. Riemer. 1950. Copeia.

TEXAS BLIND SALAMANDER — Typhlomolge rathbuni (stejneger)

Order: CAUDATA — Family: PLETHODONTIDAE

Distinguishing characteristics: A blind, white salamander, with long slender legs, a flattened snout, and permanent external gills.

Present distribution: Known only from deep wells and underground streams in caves of Hays County, Texas. Not known from Kendall and Comal Counties, Texas, although previously noted in literature (FRG).

Former distribution: Same.

Status: Considered to be headed for extinction in earlier editions of the Red Book, but now protected by the Nature Conservancy and the Texas Herpetological Society and prospects for its survival have improved.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown, probably each female produces only a very few eggs.

Reasons for decline: Capping of wells, draining of underground water sources; heavy overcollection of a very restricted population by professional and amateur biologists and by professional dealers in rare animals.

Protective measures already taken: The Nature Conservancy, acting in concert with the Texas Herpetological Society, and the American Society of Ichthyologists and Herpetologists has bought Ezell's Cave, the type locality of the species. A caretaker now lives on the property, and steps have been taken to restore the habitat by replenishment of the guano base of the food web within the cave. Further information is available from the Texas Chapter, Nature Conservancy, 909 Reliance Life Building, Dallas, Texas 75201.

Measures proposed: Should be declared a protected animal by the State of Texas.

Number in captivity: Practically none. Does not do well in captivity without special attention.

Breeding potential in captivity: None.

Remarks: Mitchell and Redell (1965) indicate that this species should be placed in the genus Eurycea. Their arguments are not conclusive, and the monotypic genus Typhlomolge is retained here.

References:

Bishop. 1943. Handbook of salamanders.
Fritz, E. C. 1968. (pers. comm.).
Gehlbach, F. Baylor Univ., Waco, Texas (pers. comm.).
Mitchell and Redell. 1965. Texas Jour. Sci., 17.

BLACK TOAD, INYO COUNTY TOAD — Bufo exsul (Myers)

Order: SALIENTIA — Family: BUFONIDAE

Distinguishing characteristics: A very small toad, adults about 2 inches long. Heavily mottled with black on olive to whitish, sometimes almost solid black above, heavily spotted and blotched with black below; skin smooth between warts.

Present distribution: Two populations, at Buckhorn Springs and Antelope Springs, in the Deep Springs Valley, and isolated desert basin between the White and Inyo Mountains adjacent to the Death Valley system, Inyo County, California. The species has been transplanted several times to springs in the area where it was not previously found (Schuierer, 1962). Success of such transplants has not been verified.

Former distribution: Same.

Status: Listed as rare by California Department of Fish and Game. A very restricted form with narrow habitat requirements. Earlier reports of habitat destruction through irrigation practices were not verified by R. R. Miller, who in 1967 found the site was relatively unchanged after a period of 25 years. The population at Buckhorn Springs appears to be stable and maintaining itself (Schuierer, 1972).

Estimated numbers: Probably a breeding population of 10,000 adults (Schuierer, 1961), although Myers (1942) thought the population might be as small as 700. Miller (1967) found the toad to be abundant in springs, irrigation ditches, and ponds on June 27, 1967, so it appears to be holding its own.

Breeding rate in the wild: Once a year; each female produces about 120 to 150 eggs per season (Savage and Schuierer, 1961), which is probably barely enough to maintain population.

Reasons for decline: Irrigation practices in area. "The annual recanalization of the water courses for irrigation has notable effect on the population. When stream modification occurred after oviposition, the marsh area dried before metamorphosis." (Schuierer, 1961).

Protective measures already taken: Springs are located on property owned by Deep Springs College, and access is restricted by the college administrators (the College has adopted this toad as its mascot). Fully protected by California law.

Measures proposed: Establishment of wildlife monument in breeding area of species; acquisition of private lands and establishment of Deep Springs Zoological Reserve proposed by the State. Active surveillance of population over period of several years to determine highs and lows in numbers of individuals; investigation of long-term success of known transplantations.

Number in captivity: Unknown, but certainly few. Occasionally collected for research purposes, and can be maintained in laboratories.

Breeding potential in captivity: Probably fairly good; most species of toads can be induced to breed in captivity, and tadpoles will metamorphose. Perhaps one or two breeding colonies should be established to maintain the species until the area is clearly preserved.

Remarks: This toad is considered to be a subspecies of Bufo boreas by some authors.

References:

Bury, R. B. 1972. Status report on California's threatened amphibians and reptiles. Inland Fisheries Administrative Report 72-2. California Dept. of Fish and Game.

Leach, H. R. and L. D. Fisk. 1972. At the crossroads--a report on California's endangered and rare fish and wildlife. California Dept. of Fish and Game.

Miller, R. R. 1967. (pers. comm.).

Myers, G. S. 1942. Occ. Pap. Univ. Mich. Mus. Zool. No. 460.

Pister, P. 1971. Survival in the desert. D.F.G. Helps college to perpetuate the rare black toad. Outdoor California, 32(1-2):16.

Savage, J. and F. W. Schuierer. 1961. Bull. S. Calif. Acad. Sci., 60.

Schuierer, F. W. 1961. Herpetologica, 17.

_____. 1962. Herpetologica, 18.

_____. 1972. The status of the endangered species Bufo exsul Myers, Deep Springs Valley, Inyo County, California. Herpetological Review, 4(2):81-82.

VEGAS VALLEY LEOPARD FROG — Rana pipiens fisheri (Stejneger)

Order: SALIENTIA — Family: RANIDAE

Distinguishing characteristics: A medium-sized frog, resembling the common leopard frog, but without a white line on the upper jaw; dorsum unspotted or with numerous small spots; yellow on under parts.

Present distribution: Unknown.

Former distribution: Vicinity of Las Vegas, Vegas Valley, Clark County, Nevada, where it was restricted to springs and seepage areas.

Status: This subspecies is extremely uncommon and perhaps is the only amphibian to have become extinct in historic times in the United States. The attention focused on the subspecies by its listing in the Red Book has produced no evidence of its survival.

Estimated numbers: No information available; probably none.

Breeding rate in the wild: Unknown.

Reasons for decline: Capping of springs and other measures involving water control have largely eliminated the habitat of this species. Introduced species in surviving habitat also contribute to elimination, since the introduced bullfrog feeds on smaller frogs, and the introduced trout eat the larvae. The last known specimens to be collected were taken in 1942.

Protective measures already taken: The State of Nevada prohibits the capture, removal, or destruction of the subspecies at any time by any means, except under special permit.

Measures proposed: A careful search for any remaining populations should be made. If they are present, an area should be set aside for their protection.

Number in captivity: None.

Breeding potential in captivity: Probably moderately good.

References:

Stebbins, R. C. 1951. Amphibians of western North America, Univ. of Calif. Press, Berkeley and Los Angeles.

Wright, A. H. and A. A. 1949. Handbook of frogs and toads. Comstock Publishing Company, Inc., Ithaca, N.Y.

HOUSTON TOAD — Bufo houstonensis (Sanders)

Order: SALIENTIA — Family: BUFONIDAE

Distinguishing characteristics: A small toad similar in appearance to the American toad, but with large postorbital crests which are heavier than the interorbital crest; and with tendency toward an obliquely striped pattern dorsally. (Sanders, 1963).

Present distribution: Nine known, isolated localities, in south-central Texas, several of which probably no longer support a population.

Former distribution: Probably as for present distribution, although possibly larger and more continuous than now.

Status: Practically extinct.

Estimated numbers: Numbered in the dozens at most localities, but in greater numbers in Bastrop area, where the species is found in Bastrop and Buescher State Parks and in adjoining areas.

Breeding rate in the wild: Probably very low. Some evidence indicates that the species often misses several breeding seasons in a row due to decreased rainfall in the spring (Brown, 1967).

Reasons for decline: The species is closely associated with loblolly pine areas, and destruction of the habitat through lumbering and road construction has eliminated suitable habitat. The populations within the city limits of Houston are apparently all gone as a consequence of city growth. In addition, the species is being swamped out genetically as a consequence of interspecies hybridization with two other toad species.

Protective measures already taken: None.

Measures proposed: Protection of habitat where possible, particularly in those State parks where the species occurs.

Number in captivity: Few, if any.

Breeding potential in captivity: Probably fairly good, since toad eggs can be fertilized and brought to maturity in the laboratory. A breeding population could be established in Texas, with the crop released in those years when the toads are unable to reproduce.

References:

Brown, L. 1967. Doctoral Thesis, University of Texas.
Sanders, O. 1953. Herpetologica, 9.

PINE BARRENS TREE FROG — Hyla andersoni (Baird)

Order: SALIENTIA — Family: HYLIDAE

Distinguishing characteristics: A small frog with expanded toe disks; lavender stripes bordered by white on a green ground color.

Present distribution: Pine barrens area of southern New Jersey; Cumberland, Sampson, Richmond, Moore and Bladen Counties in North Carolina; may also occur in Georgia.

Former distribution: Same.

Status: A very uncommon species probably approaching the precarious stage.

Estimated numbers: No information available.

Breeding rate in the wild: Once a year, with eggs deposited in late spring. Tadpoles reach maturity in the same year.

Reasons for decline: The areas in southern New Jersey inhabited by this frog are undergoing rapid development for housing and industry. Manipulation of lake levels for recreation purposes makes the habitat unsuitable for the species. If plans for utilization of a large part of the pine barrens for a jet airport are completed, there will be practically no habitat left for this frog at all.

Protective measures taken to date: None.

Measures proposed: The establishment of a Wildlife Monument in the pine barrens of New Jersey would benefit not only this species of amphibian, but also several other amphibians and reptiles feeling the encroachment of civilization on the east coast.

Number in captivity: Probably very few, and those only by private collectors. The species is very difficult to maintain in captivity.

Breeding potential in captivity: Unknown, but probably almost nil.

References:

Bullard, A. J. 1965. Herpetologica, 21:154-155.
Conant, R. (pers. comm.).
Noble, G. K. and R. C. 1923. Zoologica, 2.

AMERICAN CROCODILE — Crocodylus acutus (Cuvier)

Order: CROCODILIA — Family: CROCODYLIDAE

Distinguishing characteristics: Huge, rough-backed reptile with a sharp, pointed snout, snout width much less than width of head between eyes; 4th tooth in lower jaw exposed, does not fit into notch in upper jaw when mouth is closed.

Present distribution: South Florida and Florida Keys; Hispaniola, Jamaica, Cuba; Pacific Coast from Sinaloa to Ecuador; Atlantic coasts from Yucatan to Columbia. Much reduced in Florida to limited sections of southernmost areas and keys.

Former distribution: Same, except more widespread in Florida.

Status: In jeopardy in the United States, and perhaps throughout its range. According to Carr, declining slowly in Florida. In protected areas, probably slowly increasing. It is regarded as in peril throughout its range in the IUCN Red Book, Vol. 3, 1968.

Estimated numbers: Unknown.

Breeding rate in the wild: Once a year; 20 to 60 eggs per female.

Reasons for decline: Killed for skins; destruction of habitat; frequent hatching failures (WBR); sometimes killed as nuisance on docks and boat basins (WBR).

Protective measures already taken: Protected by law in Everglades since 1950, both Federal and State Regulations (Oliver, 1955, p. 58). The Everglades National Park provides an essential sanctuary. Legally protected in Mexico, Columbia, and Peru, although enforcement is lax. A sanctuary exists in Cuba.

Measures proposed: A thorough life history and populational study is needed to give information on which protection can be based.

Number in captivity: Most zoos and aquaria have specimens from Tropical America; North American specimens make up the majority of specimens displayed at Everglades Wonder Gardens.

Breeding potential in captivity: Probably good, if suitable material and space are provided (WBR).

References:

IUCN Red Data Book. 1968. Vol. 3, Code No.: R/14 CROCO/INT.

Moore, J. 1940. The crocodile in Everglades National Park of Florida, Univ. of Florida Publ.

Oliver, J. 1955. Natural history of North American amphibians and reptiles.

Robertson, W. B. (pers. comm.).

AMERICAN ALLIGATOR — Alligator mississippiensis (Daudin)

Order: CROCODILIA — Family: CROCODYLIDAE

Distinguishing characteristics: Huge, roughbacked reptile with a broad rounded snout; fourth tooth on lower jaw fits into notch in upper jaw.

Present distribution: On Atlantic coastal plain from Tyrrel County, North Carolina, to Corpus Christi, Texas; north in Mississippi drainage to Arkansas and southeastern Oklahoma.

Former distribution: As above, but to Rio Grande in Texas.

Status: Jeopardized by heavy poaching, which has been reduced by increased State enforcement and new Federal laws. Efforts to reopen seasons and to permit sale of hides are underway in several States.

Estimated numbers: The 1970 censuses of alligators receiving Federal protection either in wildlife refuges or the Everglades National Park show the following: South Carolina, 1,030; Florida, 36,740; Georgia, 9,650; Mississippi, 165; Louisiana, 4,460; Texas, 120; for a total of 52,165 alligators.

Breeding rate in the wild: Once a year; 15 to 85 eggs per nesting female.

Reasons for decline: Heavy poaching by collectors of commercial skins; destruction of habitat; young heavily subject to predator and human pressure.

Protective measures already taken: Federal law prohibits shipment of alligators, their hides, and hide products across State lines. Protected by law in every State where found except Texas; in Texas six counties have established protective legislation. Florida spends about $300,000 a year on alligator law enforcement; Louisiana now spends $100,000 a year for enforcement, research, and sanctuary care (Alligator Council, 1968). The city of New York and the State of California have passed regulations prohibiting trade in alligator skins.

Measures proposed: The American Alligator Council, made up of individuals interested in the protection and survival of the alligator, indicated in 1968 the following measures as desirable: (1) Elimination of markets for alligator hides, (2) provision of additional funds for law enforcement, (3) increase in education of public concerning problem, (5) establishment of central clearing house for information on alligators, (6) increase in basic research on biology of species, and (7) strengthened legislation on local and national levels.

Number in captivity: Probably thousands. The alligator farm in Buena Park, California, alone, probably has several thousand. There are 35 registered alligator farmers in Louisiana; Florida has many so-called "farms." These farms are usually only holding pens for animals captured in the wild, and the alligator is not yet truly farmed in the sense of breeding, hatching, and raising individuals to a size suitable for sale or skinning. The latter may soon be achieved in refuge areas where successful cropping of wild populations will soon be appropriate, both for restocking depleted areas and for skins.

Breeding potential in captivity: Possibly good. Several groups, particularly in Florida, are studying the possibilities of farming, but no concrete results have been announced as yet.

References:

Oliver, J. 1955. Natural history of North American amphibians and reptiles. Proc. of the American Alligator Council, 1968-69, pp. 1-24.

BOG TURTLE — Clemmys muhlenbergi (Schoepff)

Order: CHELONIA — Family: TESTUDINIDAE

Distinguishing characteristics: A comparatively small turtle, with a large orange or yellow patch on the side of the head; no scattered yellow spots on shell.

Present distribution: Isolated colonies from Connecticut to southwestern North Carolina, restricted to freshwater marshes, meadows, and bogs.

Former distribution: Same as present, but colonies less isolated prior to extensive drainage and cultivation of swampy and boggy land.

Status: Very uncommon in most localities.

Estimated numbers: 500 colonies.

Breeding rate in the wild: One a year; the number of eggs per female is probably not more than 3 to 5 (Barton and Price).

Reasons for decline: Extensive destruction of habitat for cultivation and building construction; collected for sale in pet trade where they command a high price due to their rarity.

Protective measures already taken: Now protected by law in New York State under small game section of fish and game laws. The law, passed in 1968, makes it illegal to collect, own, or sell the species in the State, and offenders have been arrested. Pennsylvania has protective laws for the species. It is fully protected in Maryland.

Measures proposed: A wildlife monument in southeastern Pennsylvania conserving an area of suitable habitat has been proposed by A. J. Barton. Stop commercial trade in turtles. Protect the species from threatened land change. Acquire most important colonies and place under Federal protection.

Numbers in captivity: Comparatively few, although traffic through pet dealers continues. East coast zoos have seen a steady decline in the numbers brought in by interested persons.

Breeding potential in captivity: Unlikely to represent a practical method for maintaining the species, although there are records of reproduction and successful hatching of eggs in captivity. Members of several herpetological scoieties are attempting to hatch eggs, and at least one individual, Kenneth Nemuras, has returned hatchlings to the original habitat.

References:

Barton, A. J. (pers. comm., 1971).
_____., and J. W. Price. 1955. Copeia.
Conant, R. (pers. comm.).
Weaver, J. (pers. comm. 1972).

GREEN TURTLE — Chelonia mydas (Linnaeus)

Order: CHELONIA — Family: CHELONIIDAE

Distinguishing characteristics: Abutting, non-overlapping shields on carapace; four pairs of lateral shields in shell; one pair of prefrontals on head; very large size; paddlelike feet.

Present distribution: Tropical oceans. Wanders up United States coasts during summer. Throughout Hawaiian archipelago.

Former distribution: Same; but once used Florida beaches as nesting sites.

Status: Practically extirpated as a breeding entity in the fauna of the mainland U.S. Still common as a breeding entity on Hawaiian Islands National Wildlife Refuge. Regarded as a "depleted" species in IUCN Red Data Book, Vol. 3, 1968.

Estimated numbers: In waters off mainland U.S., probably very few. Common in Hawaiian Islands. World-wide, still fairly common in some areas, but seriously decimated in others where they were once abundant.

Breeding rate in the wild: Reaches breeding age about sixth year. Probably nests once every three years. Average 100 eggs per female. May have several successive nests in one year.

Reasons for decline: Both animal and eggs widely used for food; eggs and young subject to very heavy predation. Subject to intense harvesting pressure in some parts of world. Overutilization in others. Now also being taken in Hawaii for its shell as trophy or curio item for tourists.

Protective measures already taken: Molestation of nesting sea turtles and their eggs is prohibited in South Carolina, Georgia, Florida, Texas, Puerto Rico, and Hawaii. Hatchlings are flown from Caribbean beaches to Florida for release. Similar release techniques are employed in Buck Island Reef National Monument, Virgin Islands, and Virgin Islands National Park. Results in the form of return of released hatchlings not verified as yet. Protected by law, closed seasons, limited harvests, restricted licenses, and other means in many parts of its range. Entry to Hawaiian Islands National Wildlife Refuge by permit only. Life history and ecological research by refuge personnel in progress. Cooperative University of Hawaii and U.S. Bureau of Sport Fisheries & Wildlife experimental rearing project in progress at University of Hawaii.

Measures proposed: Continued research and protection. Better enforcement of existing regulations; Extension of laws to areas not currently covered. Closure of waters at Northwestern Hawaiian Islands to turtle taking. Need research, including actual harvests, in main Hawaiian Islands. Close surveillance of fishing activities in future as such activities may increase around French Frigate Shoals.

Number in captivity: Practically every saltwater aquarium and a few zoos have them, often as many as 5 to 10.

Breeding potential in captivity: Unknown; no opportunity to lay eggs.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.

Hawaii Division of Fish and Game Administrative Reports.

Carr, A., and R. Ingle. 1959. The green turtle in Florida. Bull., Marine Sci. Gulf and Carib., 9(3), pp. 315-320.

Hendrickson, J. R. The Green sea turtle in Malaya and Sarawak. Proc. Zool. Soc., London, Vol. 130, Part 4, pp. 455-535. June, 1958.

IUCN Red Data Book. 1968. Vol. 3. Code No.: R/7/CHELO./MYD.

ST. CROIX GROUND LIZARD — Ameiva polops (Cope)

Order: SQUAMATA — Family: TEIIDAE

Distinguishing characteristics: A swift-moving, long-headed ground lizard; not shiny; longitudinally striped.

Present distribution: The beach at Frederiksted, St. Croix, U.S. Virgin Islands; Protestant and Green Cays, off the coast of St. Croix; 16 specimens introduced on Buck Island off northeastern corner of St. Croix by R. Ruibal and R. Philobosian in 1968.

Former distribution: Throughout St. Croix and on Buck Island.

Status: Scarce.

Estimated numbers: About 30 survive at Frederiksted, about 50 on Protestant Cay, and perhaps 100 on Green Cay. Introduced population on Buck Island still surviving and increasing in numbers, in September 1970 (R. Ruibal, pers. comm.). A relatively large population is reportedly present on Sandy Point at the western end of St. Croix.

Breeding rate in the wild: Unknown; Ameiva usually lay a small clutch of 2 to 8 eggs, but the frequency is not known.

Reasons for decline: A victim of mongoose predation and commercial development of areas where found.

Protective measures already taken: None intentionally; however, the sidewalks and other concrete pads poured along the Frederiksted beach have provided an area for the lizards to tunnel under that is impervious to mongooses. The National Park Service is attempting to eliminate the mongoose from Buck Island.

Measures proposed: The use of pesticides on the lawn and cultivated plants along the Frederiksted beach should be discouraged. The species should perhaps be reintroduced to Christiansted.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Lazell, J. D., Jr. Massachusetts Audubon Society 01773.
Ruibal, R. (pers. comm., 1969).
Seaman, G. St. Croix (pers. comm.).
Underwood, G. 1962. Reptiles of the eastern Caribbean. Caribbean Affairs (New Series) 1:192 pp.

BLUNT-NOSED LEOPARD LIZARD — Crotaphytus silus (Stejneger)

Order: SQUAMATA — Family: IGUANIDAE

Distinguishing characteristics: A robust lizard with long tail, relatively large head, rather distinct from neck and a blunt snout; dorsal scales granular; above light to dark gray with large dusky spots with whitish crossbars; throat spotted.

Present distribution: The San Joaquin Valley of central California, the adjacent Carrizo Plains, southward over the Temblor and Caliente Ranges into the Lower Cuyama Valley (mapped in Montanucci, 1970, p. 116). Total area estimated at 600 square miles (Sheppard, 1970). A locally distributed species absent from many parts of this area (Wilbur, pers. comm.).

Former distribution: Approximately as above.

Status: Apparently seriously depleted, but see below in "estimated numbers." Listed as endangered by California Department of Fish and Game.

Estimated numbers: Although earlier indications were that the species was "on the verge of total extermination," Sheppard, on the basis of a study made of a population in Kern County, California, estimated a population of 100 per square mile. However, population varies with habitat types and much of prime habitat has been destroyed.

Breeding rate in the wild: Two to seven (average four) eggs laid in June.

Reasons for decline: Subdivisions, water control, and spread of agriculture is eliminating populations very rapidly and up-to-date information is difficult to obtain. Completion of the California Aqueduct will furnish water to permit agricultural development throughout the San Joaquin Valley.

Protective measures already taken: Habitat preserved on both Kern and Pixley National Wildlife Refuges; fully protected in California as an endangered species. Inventory initiated by California Department of Fish and Game.

Measures proposed: Establishment of a national wildlife monument to preserve a sample of the original fauna and flora of the San Joaquin Valley.

Number in captivity: Few.

Breeding potential in captivity: Probably slight.

References:

Bury, R. B. 1972. Status report on California's threatened amphibians and reptiles. Inland Fisheries Report 72-2. Calif. Dept. of Fish & Game.

Leach, H. R. and L. D. Fisk. 1972. At the crossroads--a report on California's rare and endangered wildlife. Calif. Dept. of Fish & Game.

Montanucci, R. R. 1965. Observations on the San Joaquin leopard lizard, Crotophytus wislizenii silus Stejneges. Herpetologica 21(4): 270-283.

_____. 1970. Copeia, 104-123.

Sheppard, J. 1970. June 8, Mimeo Report on Crotaphytus silus.
Smith, H. M. 1946. Handbook of lizards. Comstock Publishing Co., Ithaca, N. Y.
Stebbins, R. C. 1954. Amphibians and reptiles of western North America.
McGraw Hill Book Co., Inc.
Wilbur, S. (pers. comm., 1970).

PUERTO RICAN BOA (CULEBRA GRANDE) — Epicrates inornatus (Reinhardt)

Order: SQUAMATA — Family: BOIDAE

Distinguishing characteristics: A somber grey to brown boa, reaching at least 6 feet. Top of head with small scales instead of large plates.

Present distribution: Puerto Rico; a single recent record from St. Thomas, U.S. Virgin Islands; reported from Tortola in the British Virgin Islands.

Former distribution: Unknown, but probably found on most of the larger islands of the Puerto Rico Bank.

Status: Very uncommon throughout range.

Estimated numbers: Probably fewer than 200 in Puerto Rico; isolated individuals may occur elsewhere, as the one found during destruction of a wall on St. Thomas.

Breeding rate in wild: Nothing specific known; 8 to 30 young, born alive, are usual for this genus, presumably born once a year.

Reasons for decline: Usually said to be mongoose predation, but unclear owing to survival with mongooses where known to occur and the abundance of several closely allied species of the same genus on the mongoose-infested island of Hispaniola. People usually kill every one they see, and automobiles kill a few every year in Puerto Rico.

Protective measures already taken: None.

Measures proposed: Legal protection in all U.S. sections of the Puerto Rico Bank.

Numbers in captivity: None known.

Breeding potential in captivity: Unknown.

Remarks: Submitted by James D. Lazell.

References:

Seaman, G. St. Croix, Virgin Islands (pers. comm.).
Stejneger, L. 1904. The herpetology of Porto Rico. U.S. Nat. Mus.: 549-724.
Underwood, G. 1962. Reptiles of the eastern Caribbean. Caribbean Affairs (New Series) 1:192 pp.

SAN FRANCISCO GARTER SNAKE — Thamnophis sirtalis tetrataenia (Cope)

Order: SQUAMATA — Family: COLUBRIDAE

Distinguishing characteristics: One of the most beautiful serpents in North America; dorsal scales keeled; wide dorsal stripe of greenish yellow edged with black, bordered on each side by a broad red stripe followed by a black one; belly greenish blue; top of head red.

Present distribution: Scattered colonies in the vicinity of reservoirs in the San Francisco area.

Former distribution: Western part of San Francisco peninsula from about San Francisco County line south along crest of hills, at least to Crystal Lake and along coast to Point Ano Nuevo, San Mateo County, California.

Status: Very scarce and in peril. Listed as endangered by California Dept. of Fish & Game.

Estimated numbers: Probably no more than a few hundred (Bruce Bury, pers. comm., 1972).

Breeding rate in the wild: Probably once a year. Broods of large size.

Reasons for decline: Housing developments and control of waterflow entailing removal of vegetation, both of which destroy habitat.

Protective measures already taken: Fully protected in California as an endangered species.

Measures proposed: Retain bordering and emergent vegetation in reservoir areas. Tules and other growth should be allowed to persist in brackish and fresh-water inlet areas bordering on the sea. Such growth occurs in and around the Sharp Park Golf Linds, where they may still occur. A refuge is suggested for the Crystal Lake region.

Number in captivity: Few.

Breeding potential in captivity: California biologists have one pair and the young have been released back to native areas.

Remarks: Submitted by Robert Stebbins.

References:

Bury, R. B. 1972. Status Report on California's threatened amphibians and reptiles. Calif. Inland Fisheries Adm. Report No. 72-2.

Fox, W. 1951. The status of the gartersnake, Thamnophis sirtalis tetrataenia. Copeia, 1951(4):257-267.

Leach, H. R. and L. D. Fisk. 1972. At the crossroads--a report on California's endangered and rare fish and wildlife. California Dept. of Fish and Game.

Wright, A. H. and A. A. Wright. 1957. Handbook of snakes of the United States and Canada. Comstock Publishing Associates, Ithaca, N.Y.

STATUS-UNDETERMINED REPTILES AND AMPHIBIANS

A status-undetermined species or subspecies is one that has been suggested as possibly threatened with extinction, but about which there is not enough information to determine its status. More information is needed.

Georgia Blind Salamander, Haideotriton wallacei
Suggested by R. H. Stroud.

Larch Mountain Salamander, Plethodon larselli
Suggested by Robert Stebbins.

Cheat Mountain Salamander, Plethodon nettingi
Suggested by Edward P. Cliff and by A. W. Greeley

Amarosa Toad, Bufo boreas nelsoni
Suggested by Robert C. Stebbins.

Puerto Rican Toad, Bufo lemur
Suggested by C. B. Kepler.

Illinois Chorus Frog, Pseudacris streckeri illinoensis
Suggested by Thomas S. Baskett.

Southern Rubber Boa, Charona bottae umbratica
Suggested by Glenn R. Stewart.

Key Blacksnake, Coluber constrictor haasti
Suggested by Craig Phillips.

Eastern Foxsnake, Elapse volpina gloyoll
Suggested by Ray Pawley.

Lake Erie Water Snake, Natrix sipedon insularum
Suggested by Frederick R. Gehlbach.

Giant Garter Snake, Thamnophis elegans gigas
Suggested by Robert C. Stebbins and Glenn R. Stewart.

Two-Striped Garter Snake, Thamnophis couchi hammondi
Suggested by Robert C. Stebbins and Glenn R. Stewart.

Arizona Ridge-Nosed Rattlesnake, Crotalus willardi willardi
Suggested by Steve Galizoli and Frederick R. Gehlbach

Black Legless Lizard, Anniella pulchra nigra
Suggested by Robert C. Stebbins.

Gila Monster, Heloderma suspectum
Suggested by Adrey E. Borell and Frank Richardson.

San Diego Horned Toad, Phrynosoma coronatum blaineville
Suggested by Glenn R. Stewart.

Threatened

BIRDS

of the United States

Species or subspecies of birds that are so few in numbers or so threatened by present circumstances, as to be in danger of extinction.

Arranged, one sheet for each species or subspecies, in systematic order.

NEWELL'S MANX SHEARWATER (AO) — Puffinus puffinus newelli (Henshaw)

Order: PROCELLARIIFORMES — Family: PROCELLARIIDAE

Distinguishing characteristics: A small shearwater (12-15 in.) glossy black above, pure white below.

Present distribution: Breeds on Kauai and probably other high Hawaiian Islands. Observed at sea in central Pacific Ocean. Road killed specimens found each year on Oahu.

Former distribution: Probably bred on all of the main Hawaiian Islands.

Status: Vulnerable because of very restricted breeding area. Known to breed only on mountain ridges of Kauai, Hawaii, but no evidence that it is seriously depleted at present.

Estimated numbers: Unknown, but probably a breeding population in the low thousands. About 500 estimated on one known breeding area in Makeleha Mountains, Kauai in 1967.

Breeding rate in the wild: One egg annually. Nesting success unknown.

Reasons for decline: Not known to be declining on Kauai. Reasons on other islands unknown. Possibly exterminated as nester on other islands by mongooses, pigs, dogs, rats, and other predators. Attraction to lights causes considerable mortality from collisions with cars and lighted towers.

Protective measures already taken: Protected by Federal and State law. Surveys and research studies in progress. Known nesting areas delineated and information furnished public agencies and private owners of land on which they are located.

Measures proposed: Continue exclusion of mongooses from Kauai. Preservation of natural environment including establishment of needed refuges and sanctuaries. Control predators where needed. Control of feral grazing animals. Intensify ecological and life history research.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative reports.

King, W. B., and P. J. Gould. 1967. The status of Newell's race of the Manx shearwater. The Living Bird, 6:163-186.

Richardson, F. 1955. Reappearance of Newell's shearwater in Hawaii. Auk 72:412.

_____, and J. Bowles. 1964. A survey of the birds of Kauai, Hawaii. Bernice P. Bishop Mus. Bull. 227:19.

Sincock, J. L. and G. E. Swedberg. 1969. Rediscovery of the nesting grounds of Newell's Manx Shearwater (Puffinus puffinus newelli), with initial observations. Condor, 71:69-71.

Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. Condor, 70:101-120.

HAWAIIAN DARK-RUMPED PETREL (UAU) Pterodroma phaeopygia sandwichensis (Ridgway

Order PROCELLARIIFORMES Family: PROCELLARIIDAE

Distinguishing characteristics: A large petrel, dark above with white face; white below. Underwing white with some black feathers.

Present distribution: Haleakala Crater on Maui and flanks of Mauna Kea and Mauna Loa on Hawaii.

Foremer distribution: Formerly nested at high elevations on all of the main Hawaiian Islands.

Status: Low numbers. Few observed at sea compared with related species.

Estimated numbers: Probably about 800 adults nesting in Haleakala National Park, Maui. No estimate for Hawaii, but very small numbers.

Breeding rate in the wild: One egg per year. Nesting success unknown.

Reasons for decline: Evidence that black rats are primary cause of chick mortality at Haleakala. At lower elevations mosquito-borne avian malaria and predation by mongooses may be limiting factors (Warner 1968 and Tomich 1969). Formerly collected for human consumption by early Hawaiians.

Protective measures already taken: Protected by State and Federal law. Predator control has been practiced on Maui recently. The breeding grounds of the main population lies within National Park boundaries.

Measures proposed: Preservation of natural environment including establishment of needed refuges. Control predators where needed. Intensify ecological and life history research.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife. Administrative Reports.

Hawaii Division of Fish and Game. Administrative Reports.

King, W. B. 1970. (in lit.).

Larson, V. W., unpub. ms. "The dark-rumped petrel in Haleakala Crater, Maui, 21 pp. 1967 report to National Park Service.

Munro, G. C. 1960. Birds of Hawaii. Charles E. Tuttle Co., Rutland, Vermont, and Tokyo, Japan. 192 pp.

Richardson F. and D. Woodside. 1954. Rediscovery of the nesting of the dark-rumped petrel in the Hawaiian Islands. Condor, 56: 323-327.

Tomich, P. Q. 1969. Mammals in Hawaii, a synopsis and notational bibliography. Bishop Museum Press, Honolulu.

Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. Condor, 70:101-120.

EASTERN BROWN PELICAN — Pelecanus occidentalis carolinensis (Gmelin)

Order: PELECANIFORMES — Family: PELECANIDAE

Distinguishing characteristics: A large dark gray-brown water bird with white about the head and neck in the adults. Immatures are gray-brown above and on neck, with white underparts. Flies with its head hunched back on its shoulders and its large pouched bill resting on its breast. It feeds by plunging head first into the water to capture fish.

Present distribution: Breeds on the Atlantic Coast, North Carolina to Florida, Gulf Coast of Florida, remanent breeding population on south coast of Texas and northern coast of Mexico, Central and South America to Venezuela and Pacific Coast from Guatemala to Panama, also Bahamas and Cuba. Winters more extensively on waters surrounding breeding areas.

Former distribution: Same as above, except formerly was common breeding bird on the coast of Louisiana where it is now extirpated, and more common on the coast of Texas and northeastern coast of Mexico.

Status: North Gulf Coast population extirpated from Mississippi Delta to Aransas Bay. Atlantic Coast population has greatly reduced reproduction resulting from thinning and collapsing of eggshells. This condition is most acute at northern end of range and decreases southward in eastern United States. Condition in extensive breeding range south of the border largely unknown but indication of eggshell thinning in Panama.

Estimated numbers: 8,500 breeding pairs in the United States. No estimate south of border.

Breeding rate in the wild: Usually 3 eggs, 1 to 3 young per nest. High mortality rate among preflight young.

Reasons for decline: Almost certainly caused by collapse of thin-shelled eggs or other impairment of reproductive success. Thin eggshells have been shown to be associated with excessive amounts of DDE in the food fishes, the contents of pelican eggs, and the tissues of these birds. Dieldrin is also probably associated with lack of reproductive success.

Protective measures already taken: Protected by most States. Many colonies protected by Federal and State refuges or the National Audubon Society sanctuaries. State, Federal, and private cooperative research has been directed toward analysis of the thin eggshell condition.

Measures proposed: Continue present research on effects of environmental pollution and of the life history and ecology of this species, but keep visits to nests to a minimum. Encourage strict regulation of use of persistent chemical pesticides and the discharge of wastes from plants which manufacture these products.

Number in captivity: Several hundred.

Breeding potential in captivity: Unknown.

References:

Anderson, D. W. and J. J. Hickey. 1970. Oological data on egg and breeding characteristics of brown pelicans. Wilson Bull. 82:14-28.

Blus, L. J. 1970. Measurements of brown pelican eggshells from Florida and South Carolina. BioScience 20:867-869.

_____, R. G. Heath, G. D. Gish, A. A. Belisle, and R. M. Prouty. 1971. Eggshell thinning in the brown pelican: implication of DDE. BioScience 21(24):1213-1215.

National Audubon Society. 1968. Brown pelican newsletter no. 1.

National Audubon Society. 1969. Brown pelican newsletter no. 2.

Palmer, R. S. 1962. Handbook of North American birds. Vol. I, Loons through flamingos. Yale University Press, New Haven, Conn.

Risebrough, R. W., J. Davis, and D. W. Anderson. 1970. Effects of various chlorinated hydrocarbons. pp. 40-53. In J. W. Gillett (ed.). The biological impact of pesticides in the environment. Environ. Hlth. Sci. Series No. 1, Oregon State Univ.

CALIFORNIA BROWN PELICAN — Pelecanus occidentalis californicus (Ridgway)

Order: PELECANIFORMES — Family: PELECANIDAE

Distinguishing characteristics: A large, dark gray-brown water bird with bare skin pouch on underside of long bill. Much white on head and neck of adults. Immatures have dark heads. Soaring flight with head folded back, bill resting on chest. Differs from eastern brown pelican in larger size and in having brown color of back of neck darker, almost black, and skin sac under bill reddish instead of greenish during the breeding season.

Present distribution: Breeds locally on islands along the Pacific Coast from Anacapa Island, Ventura County, California; Los Coronados, San Martin, and San Benito Islands off the coast of Baja California; islands in the Gulf of California; and south to Tres Marias Islands off Nayarit. Postbreeding movement of birds northward along the Pacific Coast in late summer and fall.

Former distribution: Same. Historically nested on Santa Cruz, San Miguel Islands, Santa Barbara County and Monterey County, California.

Status: Much reduced from former numbers in breeding colonies and as non-breeding birds off the coasts of California and Baja California. Reproduction on Anacapa Island, California, and Los Coronados and San Martin Islands, Baja California, was almost entirely unsuccessful from 1969 to 1972. Reproduction on San Benito Island, Baja California, 400 miles south of United States border, and remote islands in the Gulf of California varies. Success on islands farther south is more satisfactory.

Estimated numbers: Declining about 1,000 to 1,500 adults local to California in 1972. Declining 14 to 18 percent per year in California. Minimum population for Mexico and California over 100,000.

Breeding rate in the wild: Two or three eggs per set.

Reasons for decline: Poor reproductive success due to collapsed eggs because of thin shells, suspected to result from food contamination with DDE and/or other pollutants. Tourist disturbance to some Mexican colonies.

Protective measures already taken: State, Federal, and private cooperative research has been directed toward analysis of the thin eggshell condition and resulting reproductive success. Waste discharges from plants being corrected. Population surveys being made by Bureau of Sport Fisheries and Wildlife.

Measures proposed: Continue present research of effects of environmental pollution and life history and reproductive biology, but keep visits to nests to a minimum. Encourage strict regulation of use of persistent chemical pesticides and the discharge of wastes from plants which manufacture these products. Encourage sanctuary status for nesting colonies.

Number in captivity: Unknown.

Breeding potential in captivity: Probably slight.

References:

Anderson, D. W. and J. J. Hickey. 1970. Oological data on egg and breeding characteristics of brown pelicans. Wilson Bull. 82:14-28.

_____, J. O. Keith, R. E. White, K. A. King and L. R. Deweese. 1972. Field ecology investigations of two effects of selected pesticides on wildlife populations and brown pelicans--status of P. o. californicus. U.S. Bureau of Sport Fisheries and Wildlife, Denver Wildlife Research Center Administrative Reports.

Blus, L. J., R. G. Heath, C. D. Gesh, A. A. Belisle, and R. M. Prouty. 1971. Eggshell thinning in the brown pelican: implication of DDE. Bio-Science 21(24):1213-1215.

Bureau of Sport Fisheries and Wildlife, Administrative Reports.

Gress, F. 1970. Reproductive status of the California brown pelican in 1970 with notes on breeding biology and natural history.

Keith, J. O. 1969. Administrative report to Denver Wildlife Research Center, Bureau of Sport Fisheries and Wildlife.

_____ and L. A. Woods, Jr. 1970. Reproductive failure in brown pelicans on the Pacific Coast. Trans. 35th N. A. Wildlife Conf.

Leach, H. R. and L. O. Fisk. 1972. At the crossroads--a report on California's endangered and rare fish and wildlife. Calif. Dept. of Fish and Game.

National Audubon Society. 1968. Brown pelican newsletter No. 1.

National Audubon Society. 1969. Brown pelican newsletter No. 2.

Risebrough, R. W. 1969. Thin eggshells causing reproductive failure of brown pelicans. Unpublished report. Institute of Marine Resources, University of California, Berkeley.

_____, J. Davis, and D. W. Anderson. 1970. Effects of various chlorinated hydrocarbons. Pp. 40-53. In J. W. Gillett (ed.).

Schreiber, R. W. and R. L. DeLong. 1969. Brown pelican status in California. Audubon Field Notes 23:57-59.

_____ and R. W. Risebrough. 1972. Studies of the brown pelican. I. Status of brown pelican populations in the United States. Wilson Bull. 84:119-135.

Sibley, F. 1969. Administrative report to Patuxent Wildlife Research Center, Bureau of Sport Fisheries and Wildlife.

FLORIDA GREAT WHITE HERON — Ardea o. occidentalis — Audubon

Order: CICONIIFORMES — Family: ARDEIDAE

Distinguishing characteristics: The largest heron native to the United States; pure white with yellow beak and yellowish legs.

Present distribution: Breeds in Florida Keys, Florida Bay, and southern peninsular Florida north to southern Biscayne Bay (Arsenicker Keys) on the Atlantic Coast and to Cape Romano on the Gulf Coast. Disperses regularly (mostly immature birds) to the interior of extreme southern mainland Florida (Tamiami Trail), to Dry Tortugas, and on both coasts to Tampa Bay and Cape Kennedy. Wandering birds occasionally found farther north along both Florida coasts, and more rarely in adjacent States. Another race of this species occurs elsewhere in the Caribbean region.

Former distribution: Same. Old reports of breeding north to Tampa Bay probably unreliable.

Status: Total population very small although common within its range, which is very restricted. Subject to extreme reduction by hurricanes; 22 known to have perished as a result of Hurricane Betsy in 1965.

Estimated numbers: Based on recent aerial counts, 2,000 adults - of which about 1,500 in Everglades National Park, 400 in National Wildlife Refuges of Lower Florida Keys, and 100 in Florida Keys aside from above, and scattered along coast of southern Florida.

Breeding rate in the wild: 2-5 (usually 2 or 3) young per year.

Reasons for decline: Illegal hunting (formerly) and mortality caused by hurricanes. Reduced to about 150 after September 1935 hurricane. Everglades National Park (Florida Bay) population suffered adult mortality of about 359 (40 percent) from Hurricane Donna of September 1960. This loss was regained by 1963. Damage to the habitat by hurricanes is apparently of little importance.

Protective measures already taken: Everglades National Park and the Great White Heron, Key Deer and Key West National Wildlife Refuges protect virtually the entire range. Protected by Florida State law. Studies intended to clarify the relationship between this species and the Great Blue Heron (Ardea herodias) and to ascertain the amount of movement and interchange between the Lower Keys and Florida Bay populations are in progress. The former should give an estimate of the likelihood of loss of the Great White Heron by interbreeding with Great Blues. The latter should permit better understanding of repopulation after extirpation by hurricanes in a portion of the range which seems likely to be a recurring factor in the history of the species.

Measures proposed: Continued strict law enforcement to prevent shooting. Maintain habitat in its natural state, particularly those Keys used for nesting. Regulate use of mosquito control poisons in feeding areas.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Holt, E. G. 1928. The status of the great white heron and Wurdemann's heron. Scientific Pub. of Cleveland Mus. Nat. Hist. 1(1):1-35.

Meyerriecks, A. J. 1960. Comparative breeding behavior of four species of North American herons. Publications of Nuttall Ornithological Club, No. 2.

Robertson, W. B., Jr. Park Biologist, Everglades National Park, P. O. Box 279, Homestead, Florida.

Stieglitz, W. Biologist, Bureau of Sport Fisheries and Wildlife, Delray Beach, Florida.

HAWAIIAN GOOSE (NENE) — Branta sandvicensis (Vigors)

Order: ANSERIFORMES — Family: ANATIDAE

Distinguishing characteristics: A heavily barred, gray-brown goose with black face, buff neck with deep furrows in plumage, black bill. Feet only partly webbed.

Present distribution: Lava flows between 5,000 and 8,000 feet on the slopes of Mauna Loa, and Hualalai, Island of Hawaii. Reintroduction efforts on Maui in Haleakala Crater began in 1962. Nesting occurring but results uncertain.

Former distribution: Over a much more extensive area of the island of Hawaii, Hawaiian Islands. Possibly island of Maui.

Status: Still very uncommon and localized. Prospect for survival better than in 1949 when restoration program started.

Estimated numbers: Reduced from estimated 25,000 in latter part of 1800's to possibly less than 50. Less than 1,000 estimated in the wild in 1972.

Breeding rate in the wild: Two to five eggs per year.

Reasons for decline: Former hunting, predation by introduced mammals, such as dogs, pigs and mongooses, destruction of food and cover by grazing animals.

Protective measures already taken: Protected by Federal and State law. Bureau of Sport Fisheries and Wildlife has annual contract of $25,000 with Hawaii Division of Fish and Game to continue propagation program. The Division is continuing ecological investigations. Four refuges totaling over 50,000 acres of private land have been established in Hawaii through temporary cooperative agreements with landowners and Division of Fish and Game. As of July 1972, releases of captive-reared stock totaled 816 on Hawaii, 297 on Maui. Publicize critical status and aesthetic and scientific values.

Measures proposed: Preservation of natural environment including establishment of needed permanent refuges. Control of predators, feral grazing animals and domestic stock. Continue captive propagation program. Continue reintroduction into former range. Introduction into new range. Intensify ecological and life history research of the species.

Number in captivity: Several hundred in zoos and private and government aviaries in the United States and Europe.

Breeding potential in captivity: Good.

References:

Anonymous. 1963. A return of the nene to Hawaii. Nature 200: 945-946.
Bureau of Sport Fisheries and Wildlife administrative reports.
Elder, W. H., and D. H. Woodside. 1958. Biology and management of the Hawaiian goose. Trans. 23rd N.A. Wildlife Conf. pp. 198-215.
Hawaii Division of Fish and Game administrative reports.
Scott, P. Severn Wildfowl Trust, Slimbridge, England.

ALEUTIAN CANADA GOOSE — Branta canadensis leucopareia (Brandt)

Order: ANSERIFORMES — Family: ANATIDAE

Distinguishing characteristics: A very small race of the Canada goose, only slightly larger than the tiny cackling Canada goose. Plumage relatively dark brown above and dark gray below like neighboring races. Has the broadest white band at the base of the black neck, and when viewed from above, the most pointed bill of any race of Canada goose.

Present distribution: As far as known, confined in nesting season to Buldir Island, Aleutian Islands, Alaska. Winter range probably same as formerly. Seen at Sendai City, Northern Japan, November 1962 (Y. Yamashina). Possible sight records on Grizzly Island, Suisun Bay, California, December 1964 (J. W. Aldrich), Willamette Valley near Corvallis. Oregon, in May 1968 (D. B. Marshall), and near Willows, California, December 21, 1969 (Ben Towers). Specimen, now in National Museum, taken mid-November 1971, at Willapa Bay, Washington (J. W. Aldrich and D. B. Marshall).

Former distribution: Bred on many of the Aleutian Islands, including Amchitka, Agattu, Attu, Semichi, Atka, Unalaska, Amlia, Adak, Kanaga, Tanaga, Kiska, and Buldir. Migrated to California and Japan.

Status: Wild population very small, confined, as far as known, to one breeding island.

Estimated numbers: About 250 to 300 individuals.

Breeding rate in the wild: Average clutch about 6 eggs in captivity, 4 or 5 young each year in the wild.

Reasons for decline: Presumed to be chiefly predation by introduced Arctic foxes on their breeding grounds, with introduced rats also a possible contributing factor. Neither foxes nor rats were introduced on Buldir Island because of its relative inaccessibility, and this is presumed to have been the reason for survival of the goose breeding population.

Protective measures already taken: Arctic foxes have been eliminated from two islands on which it formerly nested, Amchitka and Agattu. Sixteen goslings were captured on Buldir Island in 1963. From their descendants, reared at Patuxent Wildlife Research Center, 75 birds of three age classes were reintroduced to Amchitka Island in spring of 1971. There have been no confirmed recoveries to date from this release. In 1972, 22 additional goslings were taken from Buldir Island to bolster captive stock.

Measures proposed: Continue to rear captive birds properly conditioned for release into the wild. The captive-reared birds will be used to restock former breeding islands as soon as they have been rid of foxes.

Number in captivity: 104 at Patuxent and 32 on loan to zoos and other selected cooperators.

Breeding potential in captivity: Excellent.

References:

Jones, R. D., Jr. 1963. Buldir Island, site of a remnant breeding population of Aleutian Canada geese, Wildfowl Trust 14th Annual Report 1961-62.

Kenyon, K. Administrative Report, Bureau of Sport Fisheries and Wildlife, San Point Naval Station, Seattle, Washington.

Marshall, D. B. 1968. Endangered plants and animals of Oregon, Part III, Birds, Extension Division, Oregon State Univ., Corvallis, Oregon.

Towers, B. (In litt. 1970).

Yamashina, Y. (in litt. 1964).

TULE WHITE-FRONTED GOOSE — Anser albifrons gambelli (Hartlaub)

Order: ANSERIFORMES — Family: ANATIDAE

Distinguishing characteristics: A medium-sized gray-brown goose with pink bill, orange or yellow feet and white patch on front of face. Variable amount of black spotting on the underparts. Immatures are dusky, without the distinctive marks of adults except the orange or yellow feet. Differs from other races of North American white-fronted geese by larger size and darker coloration.

Present distribution: Two populations, one migrating into the Pacific states and the other through the Great Plains. Breeding area for Pacific birds is unknown, but they winter in Central California. Migrants recorded in western Oregon and as far south as northwestern Mexico. Great Plains population migrates through Saskatchewan south to Texas and Louisiana. Breeding population for this group discovered by Bob Elgas and Jack Kiracope in northern Yukon Territory, Canada.

Former distribution: Nothing further known beyond that for present distribution.

Status: Difficult to determine exact status because of difficulty of distinguishing from other forms of white-fronted geese. Identified each year at hunter checking stations in California. No information on number taken in Great Plains migration route, although measurements of birds banded in Saskatchewan indicate that they are relatively scarce migrants compared with the Pacific white-fronted goose, (Anser albifrons frontalis).

Estimated numbers: Evidently only a small fraction of the approximately 200,000 white-fronted geese in North America.

Breeding rate in the wild: 5 or 6 eggs per year.

Reasons for decline: Not known to have declined but relatively tame nature, as compared with other geese, makes the tule more vulnerable to shooting.

Protective measures already taken: Studies of distribution and abundance have been conducted by the U.S. Bureau of Sport Fisheries and Wildlife, the Canadian Wildlife Service, and Bob Elgas of Big Timber, Montana. Captive propagation is underway by the Bureau and Elgas. The expedition by Elgas and Kiracofe to northern Yukon Territory where a breeding population was located was supported by the World Wildlife Fund.

Measures proposed: Continue study of only known breeding population in northern Yukon Territory. Survey adjoining areas to locate other colonies. Continue to develop capture techniques in California, and devise telemetry technique to enable tracking of Pacific population to their nesting area, which is unknown. Preserve study specimens of breeding birds to determine range of variation of this subspecies, so it can be identified in migration more certainly. Eggs should be taken from the breeding areas and adults from wintering areas for captive rearing of stock for liberation into the wild, and learning more about the biology of this goose.

Number in captivity: Several pair in possession of Bob Elgas at Big Timber, Montana, and Patuxent Wildlife Research Center propagation station of the U.S. Bureau of Sport Fisheries and Wildlife at Laurel, Maryland.

Breeding potential in captivity: Probably good.

References:

Delacour, J. 1954. Waterfowl of the world, Vol. 1:108-109.

Elgas, B. 1970. Breeding populations of white-fronted geese in northwestern Canada. Wilson Bull. 82:420-426.

Moffitt, J. 1926. Notes on white-fronted and tule geese in central California. Condor 28:241-243.

Swarth, H. S. and H. C. Bryant. 1917. A study of the races of white-fronted goose (Anser albifrons) occurring in California. Univ. California. Pubs. in Zool. 17:209-222.

Wilbur, S. R. 1966a. The tule white-fronted goose, a summary of our present knowledge. Paper presented at Cooper Ornithological Society Meeting, San Francisco State College, April 9, 1966.

_____. 1966b. Characteristics of the tule white-fronted goose (Anser albifrons gambelli) on the California wintering grounds. Progress Report 1, U.S. Bureau of Sport Fisheries and Wildlife, Sacramento Nat. Wildlife Refuge, California. 10 pp. typed.

LAYSAN DUCK — Anas laysanensis (Rothschild)

Order: ANSERIFORMES — Family: ANATIDAE

Distinguishing characteristics: Teal-sized, dull brownish duck. Similar to the Hawaiian duck but darker, particularly on head of male and with varying amounts of white around eye and on throat.

Present distribution: Resident on Laysan Island (1,117 acres), Hawaiian Islands National Wildlife Refuge in Northwestern Hawaiian Islands.

Former distribution: Same as present.

Status: Currently small and fluctuating population. Subject to sudden destruction and extinction if vegetation feeders such as rabbits or goats, or predators such as rats, cats, or dogs should arrive on the island. Accidental introduction of pest insects or plants could adversely alter ecology of the island.

Estimated numbers: Almost exterminated by 1923 when only 7 were recorded. Since 1964 population has fluctuated between 75 (1970) to 475 (1964). Estimated 175 in September, 1972.

Breeding rate in the wild: About 3 to 4 young. Brood success unknown.

Reasons for decline: Almost became extinct in early part of the century because of destruction of vegetation by feral rabbits introduced by man. Increased when rabbits were eliminated and vegetation grew back. Reasons for current fluctuations unknown.

Protective measures already taken: Island now posted with refuge warning signs. Protected by Federal and State law. Entry to island restricted and by permit only. Status of refuge and entry by permit requirement information is on official nautical charts of area and in U.S. Coast Pilot. A considerable number are in aviaries in the United States and Europe and are available for stocking purposes if needed. Prevent introduction of harmful insects, plants, and animals. Publicize critical status and aesthetic and scientific values. Patrol of refuge.

Measures proposed: Continued publicity concerning refuge status and unauthorized landings prohibited by law. Establishment of populations on other Pacific islands. Captive rearing program to include conditioning birds for release into the wild for establishing new populations. Intensify life history studies especially breeding habits and mortality factors.

Number in captivity: There are over 150 in zoos and private aviaries in the United States and Europe including a few breeding birds at the Pohakuloa State Game Farm, Hawaii.

Breeding potential in captivity: Very good.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.

Warner, R. E. 1963. Recent history and ecology of the Laysan duck. Condor 65: 2-23.

HAWAIIAN DUCK (KOLOA) — Anas wyvilliana (Sclater)

Order: ANSERIFORMES — Family: ANATIDAE

Distinguishing characteristics: Small, teal-sized duck, streaked brown and buff. Color similar to a Mexican duck in male, but with somewhat paler body and darker head. Female similar in color to a female mallard.

Present distribution: Resident on island of Kauai, Hawaii, where it inhabits coastal lagoons, marshes and mountain streams. Reintroduced experimentally on Oahu and Hawaii.

Former distribution: Resident on the main islands of the Hawaiian group except Lanai and Kahoolawe.

Status: Much reduced from former numbers.

Estimated numbers: State Division of Fish and Game personnel estimate 3,000. (Swedberg 1967).

Breeding rate in the wild: Clutch size averages 7.8 eggs.

Reasons for decline: Changes in agricultural practices (great decline in taro and rice acreages) and destruction of other wetlands, indiscriminate shooting. Predation by mongooses, (except Kauai) rats, cats, dogs, and pigs, particularly on nests.

Protective measures already taken: Protected by Federal and State law. Not hunted since 1930. Introduction of mongoose on Kauai prevented. Hawaii Division of Fish and Game has completed a special study of their ecology and conducted a propagation program with funds from the World Wildlife Fund. Many in aviaries in the United States and Europe are available for stocking purposes. In 1968, 32 were liberated in Kawainui Swamp, Oahu and 52 in Kohala Mountains, Hawaii. Some breeding by latter birds has occurred. Critical habitats identified, reasons for decline detailed and action program recommended in booklet published jointly by Bureau of Sport Fisheries and Wildlife and Hawaii Division of Fish and Game. Acquisition of key area at Hanalei as a national wildlife refuge. Negotiations in progress for other key areas on Kauai.

Measures proposed: Preservation of natural environment including establishment of needed refuges. Control predators where needed. Reintroduction into former range. Increase law enforcement effort. Continue ecological and life history research. Surveillance for chemical contamination and other such environmental pollution.

Number in captivity: Low hundreds distributed among various zoos and aviaries.

Breeding potential in captivity: Good.

References:

Hawaii Division of Fish and Game Administrative Reports.

Munro, G. C. 1960. Birds of Hawaii. Charles E. Tuttle Co., Rutland, Vermont, and Tokyo, Japan.

Swartz, C. W., and E. R. Schwartz. A reconnaissance of the game birds of Hawaii. Board of Commissioners of Agriculture and Forestry, Territory of Hawaii, 168 pp.
Swedberg, G. E. 1967. The Koloa. Hawaii Division of Fish and Game, 56 pp.
Takata, M. Division of Fish and Game, Department of Land and Natural Resources, Honolulu, Hawaii. 96813 (in lit. 1965).

MEXICAN DUCK — Anas diazi (Ridgway)

Order: ANSERIFORMES — Family: ANATIDAE

Distinguishing characteristics: A large dabbling duck, most closely resembling the black duck but lighter colored and with white-bordered speculum like a female mallard.

Present distribution: Extremely localized in southeastern Arizona, southern New Mexico and central western Texas, south in Mexican Highlands to Puebla and Michoacan.

Former distribution: Same, and farther north in the Rio Grande Valley to northern New Mexico.

Status: Extremely vulnerable although it still has a fairly large population in Mexico.

Estimated numbers: Possibly 500 in the United States; 14,760 in Mexico according to "Winter Surveys January 1970" in Mexico Winter Waterfowl Survey of Bureau of Sport Fisheries and Wildlife.

Breeding rate in the wild: Five to seven young.

Reasons for decline: Drainage of wetlands. Also hybridization with the common mallard (Anas platyrhynchos) is taking place with the southward spread of this species. This may be a result of changing remaining wetlands to a condition more suitable to the mallard than to the Mexican duck.

Protective measures already taken: The New Mexico Department of Game and Fish and Bureau of Sport Fisheries and Wildlife are developing habitat on refuges and conducting captive propagation. From progeny obtained by captive rearing, breeding pairs have been distributed to New Mexico State game farms, refuges, zoos, and private propagators. Restocking of former breeding areas has begun. Penned flock of brood stock established at Bosque del Apache National Wildlife Refuge in 1965. Habitat is being restored at San Simon Cienega by Bureau of Land Management.

Measures proposed: Research to determine if there is a specific type of habitat required by Mexican ducks, distinct from that required by mallards, which may separate the forms reproductively. Reestablishment and protection of suitable habitat in the former breeding areas; restocking suitable habitat with pure strain birds reared in captivity.

Number in captivity: Present number unknown. Mostly in possession of private propagators.

Breeding potential in captivity: Good.

References:

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CALIFORNIA CONDOR — Gymnogyps californianus (Shaw)

Order: FALCONIFORMES — Family: CATHARTIDAE

Distinguishing characteristics: North American's largest soaring land bird. Weighs 20 to 25 pounds and has a wing spread of 9 to 9½ feet. It has dark brown plumage with a large white patch under each wing and a bare orange head in the adult. The young birds have dark heads. There are light and dark phases of immature plumage the correlation of which is not understood.

Present distribution: Southern coast ranges from Santa Clara County south to the Transverse Mountains and north in the Sierra Nevada foothills to Fresno County. There may be a small population in Baja California (Wilbur).

Former distribution: In historical times, from the Columbia River in Oregon, south to northern Baja California, east to southwest Utah and Arizona. Prehistoric remains east to Texas.

Status: Of special concern because of very small population and greatly restricted breeding range.

Estimated numbers: Annual survey reported minimum counts ranging from high of 53 birds in 1969 to a low of 28 in 1970. Total population estimated at 50 to 60.

Breeding rate in the wild: Usually only one young every other year. If unsuccessful one year renesting usually occurs the next year. One pair nested 4 successive years (1966-69), producing one young each year. Approximately two young reach flying stage each year. Only two nest sites were known to be used and only one produced young in 1969.

Reasons for decline: Disturbance by man, including habit modification and shooting. Some have been killed after eating strychnine bait or strychnine poisoned animals. Possible shortage of food near nesting sites during breeding period.

Protective measures already taken: Taking and possession prohibited by Federal and State law with penalties up to a year in jail or $1,000 fine or both. Use of poison prohibited on Federal lands within the range of the condor. Two sanctuaries established by the U.S. Forest Service to protect major nesting areas. Development of a condor management plan for the Los Padres National Forest by a full-time condor biologist. An annual condor survey conducted by the California Department of Fish and Game. Appointment of a condor naturalist by the National Audubon Society. Five-year research study by the U.S. Fish and Wildlife Service. Experiments with propagation of related South American condor are in progress at the Patuxent Wildlife Research Center near Laurel, Maryland. Refusal of oil drilling rights in condor breeding area by Department of the Interior in 1971. Restricted air traffic above condor sanctuaries. Firearms closures and protection of nest sites by U.S. Forest Service in key condor areas under their control. California Department of Fish and Game have developed operational management plan.

Measures proposed: Constant cooperation of State and Federal Government and private conservation agencies in law enforcement, public education, land management, and research studies. Purchase of private lands within the Sespe Condor Sanctuary and purchase or lease of important feeding areas subject to destruction. Determine the possible benefits of supplemental feeding either in restricting wandering or providing food during critical periods.

Number in captivity: One in the Los Angeles Zoo not on display. Brought to the zoo as a fledgling in February 1967 after being deserted by its parents.

Breeding potential in captivity: Unknown, but based on experience with South American condors, thought to be good. Two unmated female California condors at the National Zoo, Washington, D.C., during several decades laid about two dozen eggs.

References:

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FLORIDA EVERGLADE KITE
(FLORIDA SNAIL KITE)

Rosthrhamus sociabilis plumbeus (Ridgway)

Order: FALCONIFORMES

Family: ACCEPITRIDAE

Distinguishing cgaracteristics: Very similar to marsh hawk but without wavering tilting flight. Adult male slate gray with black head and wing tips, white patch at base of square tail and light gray tail tip; legs and eyes red; bill extremely hooked. Female and immature heavily streaked with dark lines on buffy body, a white line over eye and a white tail patch. Distinguished from the Mexican form of the same species by smaller size and from the Cuban race by smaller bill.

Present distribution: Fresh water marshes of southern Florida; from Lake Okeechobee south through the three Conservation Areas and into the northern part of the Everglades National Park. Conservation Area 1 is the Loxahatchee National Wildlife Refuge.

Former distribution: Locally in fresh-water marshes in all of peninsular Florida.

Status: Jeopardized because of the very small population and increasingly limited amount of fresh marsh with sufficient water to insure an adequate supply of snails on which it depends for food.

Estimated numbers: Approximately 120 in 1969. Larger number than in previous years probably due to more complete coverage.

Breeding rate in the wild: Normally lays 2 to 3 eggs a year in nest on low tree or bush in fresh marsh. In 1968, 17 young were fledged from 7 of 9 known nests which is 2.4 young per successful nest. Of the two unsuccessful nests, one was destroyed by a marsh fire and the eggs did not hatch in the other nest that was located near a heavily used airboat trail.

Reasons for decline: Original population severely reduced by shooting along with other hawks, by duck hunters, together with declining habitat. Some shooting still continues and may be an important mortality factor. Drainage of marshes for agriculture and residential use is definitely a serious hazard. Drought and fire have combined with drainage of marsh habitat to reduce populations of the single species of large snail, Pomacea paludosa Say, on which the kites depend for food.

Protective measures already taken: Educational programs by Florida and National Audubon Societies and Bureau of Sport Fisheries and Wildlife to discourage indiscriminate shooting and publicize the fact that these birds need protection. Development and patrolling of sanctuaries on Lake Okeechobee by National Audubon Society. Portion of the Loxahatchee National Wildlife Refuge where kites are known to nest closed to entry and patrolled during nesting seasons by Bureau of Sport Fisheries and Wildlife. Water-hyacinth control to encourage snails practiced on Loxahatchee Refuge. Field investigations under way to determine critical factors and effective conservation measures. South American snail kites, one of four subspecies of Everglade kite, are

being reared at Patuxent Center to develop propagation techniques that will be available for use if ever needed with Florida Everglade kite.

Measures proposed: Efforts to maintain suitable water levels of additional large areas of fresh marsh in Lake Okeechobee area and closing to entry and patrolling of sections where kites are found nesting. Research on ecology of the snail Pomacea paludosa to determine proper water levels. Attempt to get Corp of Engineers and flood control district to coordinate water use to keep water levels satisfactory for kite habitat and food supply. Develop artificial potholes to assure survival of nucleus populations of snails.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

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PUERTO RICAN SHARP-SHINNED HAWK — Accipiter striatus venator (Wetmore)

Order: FALCONIFORMES — Family: ACCIPITRIDAE

Distinguishing characteristics: A small hawk with a long square-ended tail and short, rounded wings. Straight away flight with quick wing beats alternated with gliding. Adults have bluish gray upper parts with black barring on tail and underparts barred with reddish brown. Immatures are brown above and white streaked with brown below. Distinguished from the American sharp-shinned hawk (velox) by smaller size, darker coloration, and dark bands of tail heavier and more distinct.

Present distribution: Found only in the Cordillera Central of Puerto Rico between Maricao Forest and Mayaguez and in Luquillo Forest.

Former distribution: Same as present and possibly more widely distributed in mountain forests.

Status: Vulnerable because of small numbers and restricted mountain forest habitat.

Estimated numbers: No satisfactory estimate but almost certainly less than 100-200 birds.

Breeding rate in the wild: One nest found by James McCandless contained 2 eggs.

Reasons for decline: Cutting and reduction of area of mountain forests.

Protective measures already taken: Preservation of habitat incidental to establishment of Federal and State forests.

Measures proposed: A thorough study of this species to determine limits of its distribution, its abundance, and factors affecting its survival.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References:

Bond, J. 1936. Birds of the West Indies. Acad. Natural Sciences of Philadelphia and supplements 1940 to 1956.

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HAWAIIAN HAWK (IO) — Buteo solitarius (Peale)

Order: FALCONIFORMES — Family: ACCIPITRIDAE

Distinguishing characteristics: A small, soaring type of hawk. Two color phases: dark, very dark above and below; light, upper parts dark, underparts light buff often streaked.

Present distribution: Confined to Island of Hawaii. Locally common on slopes of Mauna Loa, windward and Kona coasts.

Former distribution: Same as present.

Status: In small numbers, although widely distributed on the Island of Hawaii. Much reduced from former numbers and in need of greater protection.

Estimated numbers: Probably in low hundreds.

Breeding rate in the wild: Unknown.

Reasons for decline: Alteration of environment by modern man. Habitat destruction and illegal killing which still persists.

Protective measures already taken: Protected by State and Federal laws.

Measures proposed: Preservation of natural environment. Increase law enforcement effort. Initiate ecological and life history research. Surveillance for chemical contamination and other such environmental pollution. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds, brought into the State, to prevent introduction of disease. Initiate experimental propagation program.

Number in captivity: One in Honolulu Zoo.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife, Administrative Reports.
Munro, G. D. 1960. Birds of Hawaii.

SOUTHERN BALD EAGLE — Haliaeetus l. leucocephalus (Linnaeus)

Order: FALCONIFORMES — Family: ACCIPITRIDAE

Distinguishing characteristics: Large, hawk-like, soaring bird, plumage mainly dark brown with pure white head and tail when adult. Brown blotched with white all over when immature. Distinuished from the other race of the species, the northern bald eagle, only by smaller size.

Present distribution: Nests primarily in estuarine areas of Atlantic and Gulf coasts, locally from New Jersey to Texas, and lower Mississippi Valley southward from eastern Arkansas and western Tennessee, and through southern States west to California and Baja California. Some birds wander northward in summer after nesting season to northern United States and southeastern Canada. Adult population of southern Florida essentially resident.

Former distribution: More extensive, but locally, in the southern United States the same as at present.

Status: Generally decreasing. Reproduction apparently less successful than formerly except in Everglades National Park, where about 52 pairs nested in 1965 with a success of 50 percent and a production of 1.46 young per successful nest.

Estimated numbers: About 235 active nests in 1965, 99 of which were successful.

Breeding rate in the wild: Normally, about 1.5 young per successful nest.

Reasons for decline: Increase in human population in primary nesting areas. Disturbance of nesting birds, illegal shooting, loss of nest trees, and possible reduced reproduction as a result of pesticides ingested with food by adults.

Protective measures already taken: Federal laws in the United States protect both the bald and golden eagles. The Bureau of Sport Fisheries and Wildlife and the State game departments enforce these laws. The Bureau is also studying the effects of pesticides on bald eagles. Eight National Wildlife Refuges in the southeastern United States have bald eagles nesting on them. The National Audubon Society is conducting intensive investigations of bald eagle distribution, status, breeding biology, and limiting factors. Florida Audubon Society has obtained agreements with landowners for 2,300,000 acres where nests are located to be treated as bald eagle sanctuaries. The Society makes annual inspections of these nesting sites. Access to eagle nesting areas on National Wildlife Refuges is restricted. Timber cutting, road traffic, and pesticide use have been reduced or eliminated. Cooperation of the public is being sought in reducing human activity in areas adjacent to refuges in vicinity of eagle nests. Potential nest sites (trees) are being preserved in existing and promising nesting areas. The Patuxent Wildlife Research Center has developed facilities where propagation of the northern and southern races is underway. The Center is studying pesticidal contaminants in the environment of the bald eagle and is developing captive propagation methods to produce birds to bolster wild populations or restore breeding pairs to depleted habitat.

Measures proposed: Continued surveillance of nest sites to determine success of production and to learn reasons for failures. Continued research on effects of pesticides and other presumed limiting factors. Educational programs and personal contacts with local residents and landowners in bald eagle nesting areas to obtain maximum interest and cooperation in protecting these birds and their nests. Secure cooperation of other agencies in reducing and eliminating spraying of DDT.

Number in captivity: At least 50.

Breeding potential in captivity: Limited.

References:

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Cunningham, R. L. 1960. The status of the bald eagle in Florida. Audubon Magazine, 62:24-26, 41, 43.

Imler, R. H. and E. R. Kalmbach. 1955. The bald eagle and its economic status. U.S. Fish and Wildlife Service Circular, 30:1-51.

Robbins, C. S. 1960. Status of the bald eagle summer of 1959. U.S. Fish and Wildlife Service Leaflet, 418:1-8.

Robertson, W. B. Park Naturalist, Everglades National Park, Homestead, Florida. (in lit. 1964).

PRAIRIE FALCON — Falco mexicanus (Schlegel)

Order: FALCONIFORMES — Family: FALCONIDAE

Distinguishing characteristics: Medium sized hawk with long pointed wings and long tail. Generally pale gray coloration, lighter below, with conspicuous dark patches on under sides of wings where they join the body. Flies with rapid but shallow wing beats.

Present distribution: Breeds from central British Columbia east to southern Saskatchewan and south to Baja California and northern Texas. Winters throughout breeding range and southward to central Mexico.

Former distribution: Same, but less localized.

Status: Has disappeared from many localities within its overall range.

Estimated numbers: No estimates.

Breeding rate in the wild: Usually 4 or 5 eggs per set. Insufficient data available to determine nesting success.

Reasons for decline: Not fully known. Hard pesticides and resulting decline in production of young a factor in some areas. Young taken for falconry.

Protective measures already taken: Protected by federal law and laws of some states.

Measures proposed: Study to determine decimating factors. Better nest protection. Status surveys.

Number in captivity: Not known, although certainly a number in zoos and in the possession of falconers.

Breeding potential in captivity: Unknown.

References:

Bent, A. C. 1938. Life histories of North American birds of prey (Part 2). U.S. Nat. Mus. Bull. 170: 482 pp. (18-42).

Craighead, J. J. and F. C. Craighead. 1956. Hawks, owls, and wildlife. Stackpole Co., Harrisburg, Pennsylvania, and Wildlife Management Institute, Washington, D.C.

AMERICAN PEREGRINE FALCON — Falco peregrinus anatum (Bonaparte)

Order: FALCONIFORMES — Family: FALCONIDAE

Distinguishing characteristics: Medium-sized hawk with long, pointed wings and long tail. Rapid, shallow wing beats. Adult is slate gray above, wing and tail feathers and flanks barred with black. Moustache marks on side face black. Throat white. Below white and reddish buffy, extensively spotted and barred with black. Legs and feet yellow. Immature brown above, streaked below. Larger, darker, and black markings on face more extensive than Arctic peregrine (F. p. tundrius); paler and more reddish, less grayish below than Peale's peregrine.

Present distribution: Breeds from non-Arctic portions of Alaska and Canada south to Baja California (except coast of southern Alaska and British Columbia), central Arizona and Mexico (locally); eastern limits presently follow eastern front of the Rocky Mountains in the United States; distribution local in the southern boreal forests of Canada and a few pairs still breed in Labrador. Winters chiefly in breeding range, but more northern birds move to south. Other races occur on Pacific coast of British Columbia and southern Alaska in Arctic North America and other parts of the world.

Former distribution: Same, but breeding distribution also included Eastern United States south to Georgia; also Ontario, southern Quebec and the Maritime Provinces of Canada.

Status: Extirpated as a breeding bird east of the Rocky Mountains in the United States, in Ontario, southern Quebec, and the Maritimes. Local declines reported from the western United States also taiga in Yukon Territory, Mackenzie District, and interior Alaska (Cade and Fyfe). Eggshell thickness reduced 15 to 20 percent since 1947 (Hickey and Anderson, Cade and Fyfe, Cade et al.), and taiga eggs average more than 600 ppm DDE (lipid basis); there is a highly significant negative correlation between shell thickness and DDE concentration in eggs (Cade et al.).

Estimated numbers: Number of known aeries with adults present in 1969-70, but not all producing young: British Columbia, 19 (J. Simonyi); Alberta, 3 (R. Fyfe); southern Labrador, 2 (R. Fyfe); California, 2 (H. L. Leach); Oregon, 2 (D. B. Marshall); western Mexico, 14 (M. Kirven); Arizona, 2 (J. Enderson); New Mexico, 2 (J. Enderson); Utah, 0 (C. M. White); Colorado, 6-8; Wyoming, 1; Montana, 1 (J. Enderson); Texas, 3-5 (C. M. White). Recent information lacking for Washington, Idaho, and Nevada but Nelson (in Hickey, 1969) estimated only 10 to 20 percent of pairs remaining in 1965. A few hundred pairs still breed in interior Alaska and taiga of Northwestern Canada principally along major rivers. Status in eastern Canadian boreal forest unclear but evidently not numerous.

Breeding rate in the wild: 3 or 4 eggs per set. Number of pairs laying eggs and hatching success low in southern part of range (Herman et al.); reproductive rate and number of breeding pairs also decreasing in taiga populations (Cade and Fyfe).

Reasons for decline: All field and laboratory evidence points to cumulative effects of chlorinated pesticides and their breakdown products obtained from its prey, especially DDT and DDE, which have increased adult mortality and reduced production of young by affecting reproductive mechanisms and causing eggs to become thin-shelled or otherwise nonviable. Habitat destruction and collection of young and adults for falconry have also been factors.

Protective measures already taken: Peregrine falcons are protected by Federal law and by States in the United States. Propagation techniques are being studied by Government and private investigators and at Cornell University.

Measures proposed: Eliminate use of food chain pesticides where possible. Responsible agencies should set appropriate regulations for the protection of this species. Include in international conservation agreements. Develop methods for captive propagation to bolster wild population. Initiate management-oriented research and investigate the establishment of refuges around known eyries.

Number in captivity: Not precisely known, but number of peregrines from south of the taiga in possession of falconers, zoos, and captive breeding projects believed to be less than 20 (Cade).

Breeding potential in captivity: Probably poor.

References:

Berger, D. D., D. W. Anderson, and R. W. Risebrough. 1970. Shell thinning in eggs of Ungava peregrines. Canadian Field-Nat. 84:265-267.

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Henderson, J. H. and D. D. Berger. 1968. Chlorinated hydrocarbon residues in peregrines and their prey species from northern Canada. Condor 70:149-153.

Herman, S. G., M. N. Kirven, and R. W. Risebrough. 1970. The peregrine falcon decline in California I. A preliminary review. Audubon Field Notes 24(4):609-613.

Herman, S. G. 1971. The peregrine falcon decline in California; breeding status in 1970. Calif. Fish & Game Spec. Wildlife Investigations Report.

Hickey, J. J. (editor). 1969. Peregrine falcon populations, their biology and decline. University of Wisconsin Press, Madison, 596 pp.

_____ and D. W. Anderson. 1968. Chlorinated hydrocarbons and eggshell changes in raptorial and fish-eating birds. Science 162:271-273.

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Marshall, D. B. 1969. Rare and endangered plants and animals of Oregon, Part 3. Birds. Extension Division, Oregon State University.

White, C. M. 1968. Diagnosis and relationships of the North American tundra inhabiting peregrine falcons. Auk 85:179-191.

ARCTIC PEREGRINE FALCON — Falco peregrinus tundrius (White)

Order: FALCONIFORMES — Family: FALCONIDAE

Distinguishing characteristics: Like American peregrine falcon in general appearance, but smaller and paler in coloration; black moustache marks on side of face narrower.

Present distribution: Breeds in the treeless tundra area of Arctic Alaska, Canada, and western Greenland. Migrates south chiefly through eastern and middle North America to gulf coast of United States, middle and South America as far south as Argentina and Chile. Band recoveries indicate that southward migration along the Atlantic coast may be chiefly from breeding areas in western Greenland (Shor 1970).

Former distribution: Same.

Status: Production of fledglings per occupied nest on Colville River, Alaska, dropped from 1.40 in 152 to 0.5 in 1971; 53 percent of aeries unoccupied in 1970 and 1971. Mean eggshell-thickness for this population decreased 21.7 percent since 1947; egg contents average over 800 ppm DDE (lipid basis); and there is a highly significant negative correlation between shell-thickness and DDE concentration in eggs (T. J. Cade and co-workers). In Ungava, of 8 aeries occupied in 1968, only one was occupied in 1969 (J. A. Keith); of 15 aeries examined in 1970, seven had a total of 12 young and 9 bad eggs (D. D. Berger and co-workers). Numbers have declined along the Thelon River in Northwest Territories from 10 pairs in 1966 to 4 pairs in 1970 (R. Fyfe). No obvious decline in migrants along the Atlantic or gulf coasts nor consistent reduction in ratio of young to adults has been shown (Ruos 1970); however, there has been a 31 percent reduction in the western Great Lakes migrants from the 1938-40 average to the 5-year period ending in 1967 (D. D. Berger). Experience with the rapid decline of the American peregrine indicates this subspecies is following the same pattern which led to collapse in numbers.

Estimated numbers: 200 to 300 pairs in Arctic Alaska (Cade); perhaps a few thousand pairs in Arctic Canada (Fyfe), but assumption of a large population in Canadian Arctic Islands may be erroneous (see J. Weaver and J. Grier in Cade and Fyfe, 1970). No estimate for Greenland.

Breeding rate in the wild: Average clutch size 3 (Cade 1960). Hatching success decreasing; number of pairs failing to breed increasing. Dead young noted on nesting ledges in 1969 at Bathurst Inlet and on Colville River. Periodic fluctuations in weather adverse to breeding success must be taken into consideration along with other factors (Ruos 1970).

Reasons for decline: All field and laboratory evidence points to cumulative effects of chlorinated pesticides and their breakdown products obtained from prey, especially DDT and DDE, which have increased adult mortality and reduced production of young by affecting reproductive mechanisms and causing eggs to become thin-shelled or otherwise nonviable.

Protective measures already taken: Peregrine falcons are protected at all times of the year by Federal laws and the laws of most States and Provinces. Bureau of Sport Fisheries and Wildlife, Canadian Wildlife Service, about 20 falconer-aviculturists, and Cornell University are studying artificial propagation techniques with peregrines.

Measures proposed: Work towards the elimination of food chain pesticides in the environment. Responsible agencies should set appropriate regulations for protection. All out effort to develop a self-perpetuating captive population to bolster numbers in the wild.

Number in captivity: 150 to 200 tundra or taiga inhabiting peregrines, including 15 held at Patuxent Wildlife Research Center.

Breeding potential in captivity: Probably poor. At least seven peregrines of all subspecies have been reared in captive breeding projects since 1966.

References:

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Cade, T. J. 1960. Ecology of the peregrine and gyrfalcon populations in Alaska, Univ. Calif. Pub. Zool. 63:151-290.

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Enderson, J. N. 1965. A breeding and migration survey of the peregrine falcon. Wilson Bull. 77:327-339.

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Shor, W. 1970. Banding recoveries of Arctic migrant peregrines of the Atlantic coast and Greenland populations. Raptor Research News 4(4):125-127.

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NORTHERN GREATER PRAIRIE CHICKEN — Tympanuchus cupido pinnatus (Brewster)

Order: GALLIFORMES — Family: TETRAONIDAE

Distinguishing characteristics: A brown hen-like bird of prairies; heavily barred and with short, rounded dark tail and elongated pointed feathers on each side of the neck.

Present distribution: Resident locally in prairie and other grassland habitat from eastern North Dakota and northwest Minnesota south to northeastern Colorado, and south central Oklahoma east to central Michigan, northwest Indiana, and south central Illinois. Very localized, and much reduced or extirpated from most of its former range, particularly in the more optimum habitat of the midwestern tall grass prairies.

Former distribution: Similar to present but more extensive and continuous, particularly in the eastern or tall grass prairie section of the central United States east to Ohio and Kentucky and, following a marked extension of range during early white settlement, in prairie sections of central southern Canada.

Status: Decreasing over much of its range, particularly east of the Missouri River. Extirpated in Iowa, Ohio, Kentucky, and Arkansas; doing poorly in Illinois, Missouri, Wisconsin and Minnesota, and especially in Michigan and Indiana. Much reduced but still numerous enough for hunting in parts of South Dakota, Nebraska, Kansas, and Oklahoma. Despite relatively large numbers in a few limited areas, particularly eastern Kansas, this race of greater prairie chicken is so dependent on grassland habitat, and this is disappearing so rapidly over much of its range because of increase of cultivation and grazing, the bird is vulnerable.

Estimated numbers: About 16,500 in the eastern prairies of Illinois, Missouri, Wisconsin, and Minnesota. In the Great Plains States of South Dakota, Nebraska, Kansas and Oklahoma, there is an estimated population of 796,400 to 1,069,400 birds.

Breeding rate in the wild: One brood of 11 to 14 young each year.

Reasons for decline: Loss of undisturbed grasslands resulting from cultivation, haying, grazing, and invasion of trees and shrubs. The tall grass prairies which were the main habitat of this species are exceptionally fertile and tillable and are the most extensively utilized croplands of the Continent.

Protective measures already taken: Acquisition of land is under way in a number of places for management of habitat. Six States have acquired 13,848 acres of grassland specifically for prairie chickens and 8 States have land management for these birds underway or planned. Four States are conducting research on the species. A "Prairie Grouse Technical Council" has been formed. In Wisconsin two foundations and other organizations and individuals have spent about $240,000 for land purchases dedicated to prairie chickens. Another foundation has been formed in Illinois to purchase suitable prairie land. Habitat has benefited considerably from the Federal Soil Bank program while it lasted.

Measures proposed: Acquisition and management for preservation of tall grass prairie, including about 20,000 acres where prairie chickens still occur, in each of 4 areas in South Dakota, Nebraska, Kansas, and Oklahoma. More specific management of Federal and State refuges and National Grasslands for prairie chickens by exclusion of grazing and cultivation from sufficiently large areas to permit natural tall grass habitat to become established and occasional burning to keep out shrubs.

Number in captivity: Very few.

Breeding potential in captivity: Fair.

References:

Christisen, D. M. 1969. National status and management of the greater prairie chicken. 34th N. A. Wildlife Conference: 207-217.

Cottam, C. et al. 1963. Report of the committee on bird protection.

Hamerstrom, F. N. and Frances Hamerstrom. 1949. Daily and seasonal movements of Wisconsin prairie chickens. Auk 66: 313-337.

_____, O. E. Mattson, and F. Hamerstrom. 1957. A guide to prairie chicken management. Tech. Wildlife Bull. 15, Wisc. Cons. Dept., Madison 128 p.

_____ and F. Hamerstrom. 1961. Status and problems of North American grouse. Wilson Bull. 73:284-294.

Jones, R. E. 1963. Identification and analysis of lesser and greater prairie chicken habitat. Journ. Wildlife Mgt. Vol. 27, pp. 757-778.

Sanderson, G. C. and R. J. Ellis of Illinois Natural History Survey.

Yeatter, R. E. 1943. The prairie chicken in Illinois. Bull. Ill. Nat. Hist. Surv. 22:1-99.

ATTWATER'S GREATER PRAIRIE CHICKEN — Tympanuchus cupido attwateri (Bendire)

Order: GALLIFORMES — Family: TETRAONIDAE

Distinguishing characteristics: A generally brownish hen-like bird, brown barred with black above, buffy barred with black below. Darker and more tawny above, and light colored spots smaller and more tawny above, and light colored spots smaller and more tawny than northern greater prairie chicken; also tarsi longer and more scantily feathered.

Present distribution: Very local and scattered over 11 counties in small, disjunct populations in the gulf coastal prairie of Texas, chiefly in Refugio and Colorado Counties.

Former distribution: Over the entire gulf coastal prairie of southwestern Louisiana and Texas south to the Nueces River.

Status: Exists in small numbers and there is a downward trend of population and habitat.

Estimated numbers: About 2,200 in 1971.

Breeding rate in the wild: Average about 12 eggs per set.

Reasons for decline: Reduction of natural tall grass prairie habitat below minimum requirements, chiefly by plowing and overgrazing the original prairie. The coastal prairie tall grass country is very valuable land for grazing and culture of grain sorghums, rice, and cotton.

Protective measures already taken: A thorough study of this form has been made by V. W. Lehmann. It has been protected from hunting by law for many years. The World Wildlife Fund, with assistance from the Nature Conservancy, has purchased about 3,400 acres in Colorado County, most of it original prairie, with a population of 300 to 400 Attwater's prairie chicken. A 5-year study by Texas A&M University is in progress on this area to devise management methods including controlled fires and grazing. An addition to the Aransas National Wildlife Refuge includes a few of these birds. Brush is being cleared there to improve habitat. Extensive inventory of bird populations and land ownership of occupied areas completed.

Measures proposed: Acquisition of several additional preserves of at least 5,000 acres each, in good habitat, and in as many of the areas where the birds now occur as possible.

Number in captivity: Unknown.

Breeding potential in captivity: Limited.

References:

Lehmann, V. W. 1941. Attwater's prairie chicken, its life history and management. North American Fauna 57.

_____. 1968. The Attwater's prairie chicken current status and restoration opportunities. Trans. 33rd N. A. Wildlife Conf.: 398-407.

_____ and R. G. Mauermann. 1963. Status of Attwater's prairie chicken. Jour. of Wildlife Mgt. Vol. 27, pp. 713-725.

LESSER PRAIRIE CHICKEN — Tympanuchus pallidicinctus (Ridgway)

Order: GALLIFORMES — Family: TETRAONIDAE

Distinguishing characteristics: A hen-like bird, light brown above barred with black, whitish below barred with black. Elongated feathers on sides of neck. Lighter in color and slightly smaller than the greater prairie chicken.

Present distribution: Resident locally in brush-grassland prairies, the shinnery oak and sand sagebrush habitats of the high plains in southwestern Kansas, southeastern Colorado, eastern New Mexico, Texas panhandle, and western Oklahoma. Very localized, and much reduced or extirpated from large portions of its former range. Ideal habitat is natural grassland interspersed with patches of shinnery oak.

Former distribution: About same as present, but possibly extending further north and east.

Status: Decreasing and vulnerable. Populations fluctuate markedly.

Estimated numbers: Populations in New Mexico estimated to fluctuate from 10,000 to 50,000 birds; Oklahoma 2,000 to 30,000 birds.

Breeding rate in the wild: 11 to 13 eggs; about seven young per brood at six weeks of age.

Reasons for decline: Loss of broad expanse of undisturbed prairie grasslands resulting from agriculture.

Protective measures already taken: Studies by Oklahoma Cooperative Wildlife Research Unit to learn requirements. No hunting presently permitted in Colorado. New Mexico acquired about 23,000 acres of prairie chicken habitat, in 17 areas, more than 20 years ago, and managed it by controlled grazing, supplemental planting and limited hunting. Brush control where shinnery oak becomes so extensive that there is little grassland found to increase numbers of these birds (Donaldson). Inventory of present distribution and population status in historical range made by Bureau of Sport Fisheries and Wildlife.

Measures proposed: Preservation of large blocks of grasslands where the species occurs.

Number in captivity: None known.

Breeding potential in captivity: Limited.

References:

Copelin, F. F. "The lesser prairie chicken in Oklahoma."

Donaldson, D. D. 1969. Effect on lesser prairie chickens of brush control in western Oklahoma. Doctoral Thesis, Oklahoma State University.

Halloran, A. F. 1966. The changing world of the lesser prairie chicken. Spec. Report to Division of Wildlife Refuges. Bureau of Sport Fisheries and Wildlife. 11 pp. and appendix.

Hoffman, D. M. 1963. The lesser prairie chicken in Colorado. Journ. Wildlife Mgmt. 27: 726-732.

Jackson, A. S. and R. DeArment. 1963. The lesser prairie chicken in the Texas Panhandle. Journ. Wildlife Mgmt. 27: 733-737.

Jones, R. E. 1963. Identification and analysis of lesser prairie and greater prairie chicken habitat. Journ. Wildlife Mgmt. 27: 757-778.

_____. 1964. The specific distinctness of the greater and lesser prairie chickens. Auk, 81: 65-73.

_____. 1964. Habitat used by lesser prairie chickens for feeding related to seasonal behavior of plants in Beaver County, Oklahoma. Southwestern Naturalist, 9: 111-117.

MASKED BOBWHITE — Colinus virginianus ridgwayi (Brewster)

Order: GALLIFORMES — Family: PHASIANIDAE

Distinguishing characteristics: Similar to the common bobwhite of the Eastern United States but smaller. Male with breast almost pure brick red, and head and throat black with variable amount of white forming a line over the eye. Plumage of females similar to eastern bobwhite.

Present distribution: Extremely localized in the central portion of the State of Sonora, Mexico. Definitely known from only two areas between 1,500- and 2,500-foot elevation in central Sonora where good growths of grass occur under desert shrubs and cacti.

Former distribution: More extensive than now through middle Sonora to about 50 miles north of the United States--Mexico border in central southern Arizona from the Baboquivari Mountains east to the upper Santa Cruz Valley. Its habitat in Arizona was tall grass-mesquite plains with some smaller shrubs and cactus.

Status: Extirpated from Arizona in early 1900's. Now being reintroduced. Extremely uncommon and localized in its present range in Sonora. Habitat very vulnerable to cattle grazing.

Estimated numbers: About 1,000.

Breeding rate in the wild: Average brood size 11 in 1968 and 14 in 1969.

Reasons for decline: Overgrazing, lack of fire, and consequent invasion of woody species of plants at the expense of grass which is essential for survival. Very short nesting season gives little opportunity for renesting.

Protective measures already taken: Field studies of ecology, life history, and present distribution are underway in Sonora by a biologist of the Bureau of Sport Fisheries and Wildlife. Masked bobwhites are being propagated at Patuxent Wildlife Research Center. Several releases of this stock have been made in selected areas of suitable habitat within historical range in Arizona by cooperative efforts of Federal and State of Arizona agencies.

Measures proposed: Determine location of remaining populations in Sonora. Attempt to induce owners to exclude cattle from these areas. Continue and expand present captive propagation with stock on hand supplemented with new blood from wild birds. In available habitat, determined as suitable by ecological studies in Arizona, introduce stock from captive reared flocks. Purchase land for management specifically for the masked bobwhite.

Number in captivity: About 600 in 1970. Fluctuates greatly with use of birds for release to the wild.

Breeding potential in captivity: Good.

References:

Bent, A. C. 1932. Life histories of North American gallinaceous birds. U.S. National Museum Bull. 162: 490 pp.

Director, Patuxent Wildlife Research Center, Laurel, Maryland 20810.

Monson, G. D. and A. R. Phillips. 1964. A checklist of the birds of Arizona. Univ. Arizona Press, Tucson, 74 pp.

Tomlinson, R. E. 1972. Review of literature on the endangered masked bobwhite. USDI and Fish and Wildlife Service, Resource Publ. 108. 28 pp.

_____. Administrative reports in Bureau of Sport Fisheries and Wildlife, Patuxent Wildlife Research Center, Laurel, Maryland.

Van Rossem, A. J. 1945. A distributional survey of the birds of Sonora, Mexico. Occ. Papers Mus. Zool. Louisiana State University 21: 379 pp. (72).

Walker, L. W. 1964. Return of the masked bobwhite. Zoonooz, Feb. 1964: 10-15.

WHOOPING CRANE — Grus americana (Linnaeus)

Order: GRUIFORMES — Family: GRUIDAE

Distinguishing characteristics: Very large, long-legged, long-necked bird, all white except black wing tips, back of head, and moustache markings with red skin on top of the head sparsely covered with black hairs, and pale yellow eye in adults. First-year birds have rusty brown plumage mottled with white.

Present distribution: Breeds in Wood Buffalo National Park, central southern Mackenzie, Canada. Winters on Gulf Coast of Texas, occasionally into Mexico.

Former distribution: Bred from present range south through Prairie Provinces and the northern prairie States to Iowa. Also on the Gulf Coast of Louisiana. Wintered on the Gulf Coast from Florida to Mexico.

Status: Very small numbers slowly increasing over past few decades.

Estimated numbers: 80 including 59 wild birds on Gulf Coast and 21 (17 at Patuxent Wildlife Research Center) in captivity in winter of 1971-72. Sixteen nests, largest number found occupied in one year, found in 1972 in two areas in Wood Buffalo National Park.

Breeding rate in the wild: Maximum of two young per pair per year; usually one. Total reproduction quite variable from 0 to 10 young each year.

Reasons for decline: Relegation to marginal northern portions of its breeding range by interference from man; also probably illegal shooting of nonbreeding birds in summer and migrating individuals in fall in the northern grain-producing farmlands. Occasional shooting on wintering area.

Protective measures already taken: Enforcement of the laws protecting these birds at all times by the agents of the Canadian and United States Federal wildlife agencies and Provincial and State conservation departments. Vigorous campaign of publicity by the National Audubon Society, other conservation organizations, and the press. Strict protection of the cranes on their breeding grounds by Canada and on their wintering grounds by the United States, including establishment of the 47,200-acre Aransas National Wildlife Refuge in 1937. Fenced areas planted to grain helped keep whooping cranes from wandering far from Aransas Refuge each winter since 1964. Also at Aransas a salt water impoundment stocked with marine organisms has been utilized by the cranes for feeding. Other Federal and State refuges on the migration route are utilized for resting and feeding while in transit. Research on methods of rearing this and other species of cranes in captivity and of determining their sex by external examination has been conducted by the U.S. Bureau of Sport Fisheries and Wildlife looking toward developing captive breeding stock of whooping cranes. Efforts have been made by this Bureau to obtain better utilization for reproduction purposes of whooping cranes in zoos. One of the two eggs per nest have been taken from wild nests in Canada for propagation at Patuxent without reducing the production of wild birds.

Measures proposed: Continuation of a large scale captive rearing program using eggs taken from the wild which has as its objective the rearing of these birds in captivity and eventually conditioning the progeny to return successfully to the wild. Establishment of additional refuge areas in wintering range adjoining the Aransas Wildlife Refuge and on St. Joseph and Matagorda Islands. Continuation of the publicity program to inform the public on the current status of the cranes and the need for rigid protection at all times.

Number in captivity: Nineteen.

Breeding potential in captivity: Very good.

References:

Allen, R. P. 1952. The whooping crane. Research Report No. 3 of the National Audubon Society, New York, 246 pp.

_____. 1956. A report on the whooping crane's northern breeding grounds (supplement to Research Report No. 3 of the National Audubon Society, New York), 60 pp.

McNulty, F. 1966. The whooping crane, the bird that defies extinction. E. P. Dutton & Co., New York, 190 pp.

Novakowski, N. S. 1966. Whooping crane population dynamics on the nesting grounds, Wood Buffalo National Park, Northwest Territories, Canada. Canadian Wildlife Service Report Series - No. 1:1-20.

FLORIDA SANDHILL CRANE — Grus canadensis pratensis (Meyer)

Order: GRUIFORMES — Family: GRUIDAE

Distinguishing characteristics: Long legs, neck, and bill. All gray plumage. Bare red skin on crown. Smaller except for length of leg than the greater sandhill crane. Larger than the lesser sandhill crane.

Present distribution: Permanent resident in wet prairies, particularly Kissimmee Prairie in Florida and extreme southern Georgia (Okefenokee Swamp). About 10 pairs in Everglades National Park.

Former distribution: Same general region as present, but in more localities.

Status: Localized and vulnerable. Habitat diminishing, but no indication that they are critically threatened at present. Status possibly improved recently due to fencing of ranches and protecting of cranes on such properties.

Estimated numbers: Between 2,000 and 3,000 estimated by Bureau of Sport Fisheries and Wildlife in 1964. Sprunt (1942) estimated 2,650.

Breeding rate in the wild: Two eggs laid each year. Usually no more than one young reared. Annual production rate unknown.

Reasons for decline: Not known to be declining but increased human populations and conversion of some of wet prairie habitat for agriculture might start a downward trend.

Protective measures already taken: Protected by Federal and State law. The Okefenokee Swamp breeding area now included in a Federal refuge. Also nests on Loxahatchee National Wildlife Refuge in southern Florida. Reared successfully in captivity in San Diego, California Zoo. Bureau of Sport Fisheries and Wildlife has a captive rearing program of Florida sandhill cranes.

Measures proposed: Preservation of some of the Florida wet prairies as refuges. Continue captive rearing program to produce stock for subsequent liberation in suitable habitat.

Number in captivity: About 50, including eight in Great Bend, Chicago, New York, San Antonio, and San Diego Zoos in 1963 (pair nested at San Diego in 1965); and about 40 at Patuxent Wildlife Research Center.

Breeding potential in captivity: Good.

References:

Walkinshaw, L. H. 1949. The sandhill crane. Cranbook Institute of Science, Bull. 29: 202 pp.

Williams, L. E., Jr., and R. W. Phillips. 1972. North Florida Sandhill Crane Populations. Auk 89: 541-548.

MISSISSIPPI SANDHILL CRANE — Grus canadensis pulla (Aldrich)

Order: GRUIFORMES — Family: GRUIDAE

Distinguishing characteristics: Same size as Florida sandhill crane but plumage darker colored. The darkest colored of all the subspecies of sandhill cranes.

Present distribution: Jackson County, Mississippi, near Ocean Springs and Fontainbleau between the Pascagoula River on the east and Jackson-Harrison County line on the west; U.S. Highway 90 on the south and Bluff Creek on the north (Valentine and Noble, 1970).

Former distribution: More extensively distributed in areas of suitable habitat along the Gulf Coastal Plain of Louisiana, Mississippi and Alabama.

Status: Nearing extinction because of very small and restricted population and deteriorating habitat.

Estimated numbers: Between 38 and 40 (Valentine and Noble, 1970).

Breeding rate in the wild: One or two young per pair each year.

Reasons for decline: Chiefly because of reduction of suitable habitat which is semiopen and wet pine savannah by changing land use including drainage, planting of trees, suburban development and highway building.

Protective measures already taken: Bureau of Sport Fisheries and Wildlife is rearing this species in captivity from eggs taken from wild nests with the intention of establishing new wild populations.

Measures proposed: Acquisition and restoration of habitat in present range and adjoining areas. Rerouting proposed U.S. Interstate Highway No. 10 in Mississippi. Expand captive rearing program to produce stock for subsequent liberation.

Number in captivity: Nine at the Patuxent Wildlife Research Center.

Breeding potential in captivity: Fair.

References:

Aldrich, J. W. 1972. A new subspecies of sandhill crane from Mississippi. Proc. Biol. Soc. Wash. 85:63-70.

Howell, A. H. 1928. Birds of Alabama (2nd Ed.) U.S. Department of Agriculture. Bureau of Biological Survey and Department of Game and Fisheries of Alabama. 384 pp.

McIlhenny, E. A. 1938. Florida crane a resident of Mississippi. Auk 55:598-602.

_____. 1943. Major changes in the bird life of southern Louisiana during sixty years. Auk 60:541-549.

Valentine, J. M., Jr., and R. E. Noble. 1970. A colony of sandhill cranes in Mississippi. Journal Wildlife Management 34:761-768.

Walkinshaw, L. H. 1949. The sandhill cranes. Cranbrook Institute of Science, Bull. 29:202 pp.

CALIFORNIA CLAPPER RAIL — Rallus longirostris obsoletus (Ridgway)

Order: GRUIFORMES — Family: RALLIDAE

Distinguishing characteristics: Like other races of clapper rails, it has a gray-brown back, breast and upper belly tawny, flanks dark gray barred with white, tail short with white below. Hen-like in action and has long legs. Bill, legs, and feet larger and color of plumage more grayish than light-footed clapper rail.

Present distribution: Resident in salt marshes of San Francisco Bay and Moss Landing. Casual along the coast of central western California at Tomales Bay, Humboldt Bay, Bolings Bay, and Morro Bay. Present range about the same as earlier distribution except that smaller segments of suitable habitat remain and further inroads may be anticipated.

Former distribution: About the same as today except more restricted now by habitat losses.

Status: Vulnerable because of restricted habitat which is rapidly decreasing. It depends on salt and brackish tidal marshes with an abundant growth of cordgrass (Spartina foliosa) and pickleweed (Salicornia virginica). It also needs the quality of water which supports mollusks and other small invertebrates as food items found in the mud bottom sloughs.

Estimated numbers: Total population is not known. Two or three pairs per 100 acres of good habitat is estimated on basis of call notes heard.

Breeding rate in the wild: Birds are reported to lay from 5 to 14 eggs per clutch.

Reasons for decline: Population decline due to a reduction in salt marsh habitat and pollution causing a reduction in habitat and food supply. Filling of bays and estuaries for urban development is causing the biggest decline in suitable habitat, and this is particularly true in the San Francisco Bay area where most of the remaining birds are resident.

Protective measures already taken: The species is protected by Federal and State law. Abate water pollution wherever possible for this species as well as other water-associated birds. Establishment of South Francisco Bay National Wildlife Refuge and acquisition of Tubbs Island by The Nature Conservancy are beginnings toward habitat preservation. A Bureau of Sport Fisheries and Wildlife research biologist is working part-time on this bird.

Measures proposed: Acquisition and/or agreements with property owners to retain suitable marsh habitat for this and other water-associated birds. Further improvement in controlling water quality in problem areas.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

Gill, R. 1972. South San Francisco Bay breeding bird survey. California Dept. of Fish and Game. Wildlife Management Branch Administrative Report No. 72-6.

Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. Cooper Ornithological Club, Berkeley, California.

Hoffman, R. 1927. Birds of the Pacific States. Houghton Mifflin Company, Boston.

Leach, H. R. and L. O. Fisk. 1972. At the crossroads. California Dept. of Fish and Game. pp. 21-22.

Wilbur, S. Administrative reports, Bureau of Sport Fisheries and Wildlife.

LIGHT-FOOTED CLAPPER RAIL — Rallus longirostris levipes (Bangs)

Order: GRUIFORMES — Family: RALLIDAE

Distinguishing characteristics: Similar coloration to the California clapper rail but has a darker back, richer breast, and legs, feet, and bill are smaller.

Present distribution: A very small number of these birds still exist in a few remaining places in tidal salicornia marshes from Santa Barbara County to the Mexican border. Largest populations apparently are at Anaheim Bay, Orange County, and at the mouth of the Tijuana River, San Diego County. There are other reports for 1920 from Mission Bay, San Diego County, and upper Newport Bay, Orange County (Wilbur). Distribution in Mexico unknown.

Former distribution: Formerly common resident in all salt marshes from Santa Barbara County to the Mexican border and probably also to northwestern Baja California.

Status: Vulnerable because north of Mexican border majority of individuals are in 10 small marshes. Most of them are in 2 marshes. The others have very small populations. Decreasing because of the decrease in suitable tidal salicornia marsh habitat.

Estimated numbers: Unknown. In Anaheim Bay in 1959 approximately 200 were seen on an extremely high tide. In 1970 estimated number of 50 heard calling there.

Breeding rate in the wild: Approximately 5 to 14 eggs per clutch.

Reasons for decline: Destruction of its natural habitat by filling for housing and industrial use, marina development and water pollution destroying food species and/or habitat.

Protective measures already taken: It is protected by Federal and State law, and attempts are being made to protect its habitat from reclamation and water pollution through acquisition of land for refuges, zoning and cooperative agreements with the Department of Defence which holds some of this bird's habitat. A Bureau of Sport Fisheries and Wildlife biologist is working part-time on this subspecies.

Measures proposed: Acquisition and/or agreements with property owners to retain suitable marsh habitat for this and other water-associated birds. Improvement of the control of pollution in problem areas. Surveys to determine status of remaining population.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. Cooper Ornithological Club, Berkeley, California.

Hoffman, R. 1927. Birds of the Pacific states. Houghton Mifflin Co., Boston.

Kirven, M. N. (in lit.)

McCaskie, R. G. (in lit.)

Wilbur, S. R. Administrative reports, Bureau of Sport Fisheries and Wildlife.

YUMA CLAPPER RAIL — Rallus longirostris yumanensis (Dickey)

Order: GRUIFORMES — Family: RALLIDAE

Distinguishing characteristics: In size and appearance similar to a small hen, but has long, slender, slightly decurved bill, longish legs. Very short tail is white beneath. General color tawny and grayish with barred flanks. Paler and smaller than other American clapper rails. Downy young are black.

Present distribution: Restricted in the breeding season to cattail-tule marshes along lower Colorado River from the Colorado Delta in Mexico north Needles, California, in two small marshes along the lower Gila River, in two small marshes immediately south of Phoenix, Arizona, and at the lower end of the Salton Sea. Concentrated mainly in Havasu Lake, Cibola, and Imperial National Wildlife Refuges. Birds migrate but winter range unknown at this time.

Former distribution: Marshes of the lower Colorado River from the Parker area south into the delta, in Mexico, and at the southeastern end of Salton Sea.

Status: Occurs in small numbers and limited breeding habitat due to continuing channelization of the Colorado River with its continued loss of marshes and sloughs through draining and covering with spoil. At Salton Sea, increasing salinity of water and destruction of vegetation in drainage canals has eliminated suitable habitat.

Estimated numbers: 500 to 1,000 individuals along either side of lower Colorado River in Arizona and California. Survey in May and June 1969 along 240 miles of river recorded 142 birds.

Breeding rate in the wild: Very little data; probably six to ten young.

Reasons for decline: Not certain that it has declined but adverse factors are drainage of marshes by channelization and filling programs. Increased salinity of Salton Sea and removal of marsh plants by both physical and chemical means.

Protective measures already taken: Setting aside of Havasu Lake, Imperial, and Cibola National Wildlife Refuges on Colorado River. Study underway by Bureau of Sport Fisheries and Wildlife biologist to determine numbers of birds, their distribution, and habitat requirements. Fully protected under California Fish and Game Code.

Measures proposed: Marsh management on public lands within the range of this subspecies for specific purpose of providing clapper rail habitat. Continuing surveys to determine location and size of populations. Study of taxonomic relationship of clapper rails of the lower Colorado River Valley and populations of this species along the Gulf of California. Band Yuma clapper rails to determine wintering area.

References:

Dickey, D. R. Description of a new clapper rail from the Colorado River Valley. Auk 1923: 90-94.

Phillips, A., J. Marshall, and G. Monson. The birds of Arizona. Univ. of Arizona Press, 1964. p. 31.

Tomlinson, R. E. Administrative reports, Bureau of Sport Fisheries and Wildlife.

CALIFORNIA BLACK RAIL — Laterallus jamaicensis coturniculus (Ridgway)

Order: GRUIFORMES — Family: RALLIDAE

Distinguishing characteristics: A tiny blackish rail about 5 to 6 inches long, head and neck black, nape deep chestnut, back blackish-brown with white spots, and flanks black with white bars. Birds are very difficult to flush or observe.

Present distribution: This tiny rail is so elusive and secretive that it is seldom seen, and consequently little is known in regard to its present or former distribution. Usually it is associated with pickleweed along the tidal marshes from Tomales Bay and San Francisco, south and casually inland to Stockton, Riverside, and Salton Sea. Substantial numbers along Colorado River.

Former distribution: Thought to be about the same as today.

Status: Vulnerable because much of its former habitat has been destroyed. Coastal marshes where many observations were made have been filled or are in jeopardy. Seems to favor habitat of alkali bulrush and saltgrass.

Estimated numbers: Unknown.

Breeding rate in the wild: Four to eight eggs per clutch.

Reasons for decline: A reduction in population is thought to be due to a reduction in tidal marsh habitat by filling, draining, and/or pollution, channelization and phreatophyte control along Colorado River.

Protective measures already taken: Attempts are being made to preserve remaining habitat and maintain better water quality. Studies on ecology, distribution and abundance being made by State and Federal biologists in conjunction with studies of other rails.

Measures proposed: Protect available habitat, especially tidal marshes, from being destroyed.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. Cooper Ornithological Club, Berkeley, California.

Hoffman, R. 1927. Birds of the Pacific States. Houghton Mifflin Co., Boston.

Kirven, M. N. in lit.

McCaskie, R. G. in lit.

Tomlinson, R. E. Bureau of Sport Fisheries and Wildlife, Administrative reports.

_____ and R. L. Todd. Distribution of two western clapper rail races as determined by responds to taped calls. Condor. in lit.

HAWAIIAN GALLINULE (ALAE ULA) Gallinula chloropus sandvicensis (Streets)

Order: GRUIFORMES Family: RALLIDAE

Distinguishing characteristics: A grayish marsh bird with brown back, greenish-yellow, red-tipped legs, and red bill with yellow tip, white side stripes and white patch under tail. Distinguished from other races of the common gallinule by having more red on the legs. It is much darker and blacker, less bluish gray, and has less white on the underparts than the North American race.

Present distribution: Resident only on the islands of Kauai, Molokai, and Oahu in Hawaii.

Former distribution: All main islands except Lanai and Niihau.

Status: Greatly decreased from former abundance, particularly on island of Oahu. Most numerous on island of Kauai.

Estimated numbers: Kauai--mid hundreds; Oahu--low hundreds.

Breeding rate in the wild: Unknown.

Reasons for decline: Elimination of fresh water ponds and other wetlands which form its habitat. Predation by mongoose (except Kauai), rats, and feral cats. Illegal hunting.

Protective measures already taken: Protected by Federal and State Law. National wildlife refuge established at Hanalei, Kauai. Negotiations for other key areas in progress. Booklet which details causes for decline, loss of habitats, brief descriptions and life history, key areas and recommended action program published jointly by Bureau of Sport Fisheries and Wildlife and Hawaii Division of Fish and Game.

Measures proposed: Preservation of natural environment and continue establishment of needed refuges and sanctuaries. Control predators where needed. Initiate captive propagation program. Reintroduction into former range. Increase patrol and/or law enforcement effort. Initiate ecological and life history research of the species. Surveillance for chemical contamination and other such environmental pollution. Continue to publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease.

Number in captivity: A dozen raised in Honolulu Zoo up to 1972.

Breeding potential in captivity: Very good. Have been bred successfully in Honolulu Zoo on several occasions.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.
Hawaii Division of Fish and Game Administrative Reports.
Schwartz, C. W., and E. R. Schwartz. 1949. A Reconnaissance of the game birds in Hawaii. Board of Commissioners of Agriculture and Forestry, Territory of Hawaii. 166 pp.

HAWAIIAN COOT (ALAE KEOKEO) — Fulica americana alai (Peale)

Order: GRUIFORMES — Family: RALLIDAE

Distinguishing characteristics: Dark slate-gray duck-like bird. Almost blackish at a distance. White bill. White patches under tail. Differs from the American coot in having darker plumage, more slender bill, and particularly in the much larger and whiter bare area on the forehead.

Present distribution: Islands of Oahu, Maui, Kauai, Niihau, Molokai, and Hawaii. Migrates between islands.

Former distribution: Probably the same.

Status: Decreasing in numbers and habitat is being eliminated. A key area, Kanaha Pond, Maui, threatened by Federal and State airport interests.

Estimated numbers: Since 1969, special statewide census show ranges from 688 to 1,667. In 1972, 352.

Reasons for decline: Destruction of marshes and other wetlands. On game bird list until 1939. Subject to predation by free-roaming dogs, cats, and mongoose. Harrassment and illegal shooting.

Protective measures already taken: Protected by Federal and State law. No open hunting seasons since 1939. Bureau of Sport Fisheries and Wildlife conducted a wetlands survey in cooperation with Hawaii Division of Fish and Game. Acquisition of key area at Hanalei, Kauai for national wildlife refuge. Negotiations in progress for acquisition of other key areas. Cooperative agreement with U.S. Navy has established wildlife refuges at Pearl Harbor and Lualualei, Oahu. Booklet published jointly by Bureau of Sport Fisheries and Wildlife and Hawaii Division of Fish and Game which describes endangered Hawaiian waterbirds, including this species, causes for decline, key areas, and recommended action programs.

Measures proposed: Preservation of natural environment and continued establishment of needed refuges. Control predators. Prevent introduction of harmful insects, plants, and animals. Increase law enforcement. Initiate ecological and life history research. Surveillance for chemical contamination and other such environmental pollution. Continue to publicize status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease.

Number in captivity: Unknown if any.

Breeding potential in captivity: Considered easy to raise.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.
Hawaii Division of Fish and Game Administrative Reports.
Munro, G. C. 1960. Birds of Hawaii. 192 pp.
Schwartz, C. W. and E. R. Schwartz. 1949. A Reconnaissance of the game birds in Hawaii. Board of Commissioners of Agriculture and Forestry, Territory of Hawaii. 166 pp.

ESKIMO CURLEW — Numenius borealis (Forster)

Order: CHARADRIIFORMES — Family: SCOLOPACIDAE

Distinguishing characteristics: Medium sized shorebird, like a small whimbrel but bill only about 2 inches long and slightly curved, blacker above and on the head, the feathers with warm buffy brown tips. Underparts warm buffy. Under surface of wings conspicuously cinnamon buff.

Present distribution: One or two spring migrants seen on the Texas coast in 1950, 1959, 1960, 1961, and 1962. Not recorded there since. Specimen taken in fall migration of 1963 in Barbados, West Indies, now in Philadelphia Academy of Natural Sciences. A sight record was made at Cape May, New Jersey, September 20, 1959, and another near Charleston, South Carolina, July 15, 1956.

Former distribution: Nested in the tundra of northern Mackenzie and possibly northeastern Alaska. Wintered in grasslands from southern Brazil, south to southern Argentina and Chile. In fall migration occurred chiefly in the interior prairie portions of the continent.

Status: Apparently very rare. Known only from one or two migrants seen occasionally in spring migration, and one recent fall migrant specimen. No record since 1963. Present breeding and wintering range unknown. Last winter record was for Province of Buenos Aires, Argentina in 1939 (Wetmore 1939).

Estimated numbers: No basis for estimating.

Breeding rate in the wild: One brood of four young annually.

Reasons for decline: Excessive shooting formerly. Present limiting factors unknown.

Protective measures already taken: Along with all other Scolopacidae, except the common snipe and woodcock, there has been complete protection from hunting by law in the United States and Canada for many years. Canadian Wildlife Service field personnel alerted to pay special attention to curlews in hopes that more information can be obtained on their distribution.

Measures proposed: Special diligence in protection against undue disturbance during migration in places where these birds have been recorded in recent years. Effort to locate wintering populations in southern South America and breeding populations in Canada to determine what limiting factors may exist there.

Number in captivity: None.

Breeding potential in captivity: Unknown.

References:

Emanuel, V. E. 1962. Texans rediscover the nearly extinct Eskimo Curlew. Audubon Magazine, May - June, pp. 162-165.

Weston, F. M., and E. A. Williams. 1965. Recent records of the Eskimo Curlew. Auk 82: 493-496.

Wetmore, A. 1939. Recent observations on the Eskimo curlew in Argentina. Auk 56: 475-476.

Williams, G. G. 1959. Probable Eskimo Curlew on Galveston Island, Texas. Auk 76: 539-541.

HAWAIIAN STILT (AEO) — Himantopus himantopus knudseni (Stejneger)

Order: CHARADRIIFORMES — Family: RECURVIROSTRIDAE

Distinguishing characteristics: Shorebird with sharply contrasting color pattern, black above, white below; very long red legs. Distinuished from North American black-necked stilt by extension of black on head farther down on the forehead, and black on neck to sides and front of neck, and by longer bill, tarsus, and tail.

Present distribution: Islands of Kauai, Niihau, Maui, Hawaii, Molokai (occasionally) and Oahu of the Hawaiian Islands. Known to migrate (degree unknown) between Oahu and Maui. Suspected to migrate between others. Maui and Oahu support largest numbers followed by Kauai, Niihau, Hawaii, and Molokai.

Former distribution: All main Hawaiian Islands.

Status: Decreasing because of habitat destruction. A key area, Kanaha Pond, Maui threatened by Federal and State airport interests.

Estimated numbers: Since 1968 special statewide census shows ranges in population from 934 to 1,513. Count in 1972 was 1,366.

Breeding rate in the wild: Usually 4 eggs per year, occasionally fewer.

Reasons for decline: Draining and filling of marshes and shallow ponds. On the gamebird list until 1941. Predation by mongoose, feral cats and dogs. Occasional illegal shooting.

Protective measures already taken: Elimination of hunting in 1939. Protected by Federal and State law. Cooperative agreement has established refuge in habitat on Kaneohe Marine Corps Air Station and Pearl Harbor Naval Base Lualualii Ammunition Depot. Critical habitats identified as causes for decline. Detailed and recommended action program publicized in booklet published by Federal-State wildlife agencies. Booklet published jointly by Bureau of Sport Fisheries and Wildlife and Hawaii Division of Fish and Game describing endangered Hawaiian waterbirds including this species, causes for decline, key areas and recommended action program. National wildlife refuge established at Hanalei, Kauai. Protection in progress for other key areas.

Measures proposed: Preservation of natural environment and continued establishment of needed refuges. Control predators where needed. Prevent introduction of harmful insects, plants, and animals. Increase law enforcement effort. Initiate ecological and life history research on the species. Surveillance for chemical contamination and other such environmental pollution. Continue to publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease.

Number in captivity: Unknown if any.

Breeding potential in captivity: Unknown.

References:

Berger, A. J. 1967. Auk (84), p. 130.

Bureau of Sport Fisheries and Wildlife Administrative Reports.

Hawaii Division of Fish and Game Administrative Reports.

Munro, G. C. 1960. Birds of Hawaii. 192 pp.

Schwartz, C. W., and E. R. Schwartz. 1949. A Reconnaissance of the game birds in Hawaii. Board of Commissioners of Agriculture and Forestry, Territory of Hawaii. 166 pp.

CALIFORNIA LEAST TERN — Sterna albifrons browni (Mearns)

Order: CHARADRIFORMES — Family: LARIDAE

Distinguishing characteristics: A small tern with a yellow bill. Adults are white with a pale gray mantle, forehead white, black cap, wings with a dark area on leading edge. Has quicker wingbeats than other terns, and it can hover for a longer time.

Present distribution: Breeds along Pacific coast from South San Francisco Bay, California, to southern Baja California. Nonbreeding birds range north to Alameda County in summer.

Former distribution: Thought to be approximately the same as the present range.

Status: Critical because of disturbance to limited nesting habitat. Locally common where suitable nesting areas occur. Disappearing from disturbed areas, and nesting temporarily on new-made land from dredged sand at Huntington Beach.

Estimated numbers: In 1970, 300 pairs nested in 15 sites.

Breeding rate in the wild: Generally two eggs laid in a shallow depression in the sand.

Reasons for decline: Nesting habitat is being lost because of increased human activity on beaches which are preferred for nesting sites.

Protective measures already taken: Huntington Beach State Park Tern Sanctuary established by State. Santa Margarita River Tern Sanctuary established on Camp Pendleton Marine Base. Buena Vista Lagoon Ecological Reserve established by State. Nesting habitat developed by Navy at Seal Beach Naval Weapons Station. Classified as endangered under California Game Code.

Measures proposed: Take measures necessary to protect nesting areas not already protected from motor scooters, dune buggies, and other human encroachment. Restore sites formerly used by terns. Create new artificial sand islands by dredging in protected areas.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

California Department of Fish and Game.
Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. Cooper Ornithological Club, Berkeley, California.
Hoffman, R. 1927. Birds of the Pacific States. Houghton Mifflin Company, Boston.
Kirven, M. N. (in lit.).
Leach, H. R. and L. O. Fisk. 1972. At the crossroads. A report on California's Endangered and Rare Fish and Wildlife. California Department of Fish and Game.

Longhurst, A. R. 1969. Status of an endangered bird species (Sterna albifrons) in San Diego County, 7 pp. mimeographed.
McCaskie, R. G. (in lit.).
Wilbur, S. R. Administrative Reports, Bureau of Sport Fisheries and Wildlife.

PUERTO RICAN PLAIN PIGEON — Columbia inornata wetmorei (Peters)

Order: COLUMBIFORMES — Family: COLUMBIDAE

Distinguishing characteristics: Size of domestic pigeon. Head and forepart of body pinkish violet. Back grayish brown. Rump and tail gray. Wing coverts margined with white. Differs from other subspecies of plain pigeon by darker coloration.

Present distribution: Woodland near Lago de Cidra, 22 km. southwest of Caguas, Puerto Rico; possibly also Cerro de la Tabla, 12 km. south of Lago de Cidra.

Former distribution: Formerly widespread in the western foothills and valleys of Puerto Rico. Old records exist from Utuado, Lares, Anasco, Morovis (cave deposits) and Ponce (cave deposits).

Status: Formerly considered extinct, now known to occur, apparently in very small numbers. Since 1961 known to have been shot occasionally and indiscriminately by hunters who do not distinguish it from other wild pigeons. Has appeared for sale as food in Ponce. Thought by some observers to be increasing in numbers.

Estimated numbers: Possibly several hundred scattered in lowland forests. 18 seen Lago de Cidra, April 1969.

Breeding rate in the wild: Unknown.

Reasons for decline: Unknown, but probably overhunting and extensive destruction of natural forest habitat.

Protective measures already taken: 1969 hunting regulations specifically closed the municipality of Cidra to hunting.

Measures proposed: Complete prohibition of hunting of this species. Study to determine its requirements and limiting factors.

Number in captivity: None known.

Breeding potential in captivity: Because of close relationship to domestic pigeon, probably good.

References:

Bond, J. 1950. Checklist of birds of West Indies. The Academy of Natural Sciences of Philadelphia.

IUCN Bull. No. 17, October-December 1965. p. 3.

Kepler, C. B. Administrative reports, Bureau of Sport Fisheries and Wildlife.

Leopold, N. F. 1963. Checklist of birds of Puerto Rico and the Virgin Islands. University of Puerto Rico Agric. Exp. Sta. Bull. 168. Rio Piedras, P. I. 119 pp.

PUERTO RICAN PARROT — Amazona vittata (Boddaert)

Order: PSITTACIFORMES — Family: PSITTACIDAE

Distinguishing characteristics: A bright green parrot, about a foot in length, with red forehead, blue primary wing feathers, and flesh colored bill and feet.

Present distribution: Confined to Sierra de Luquillo and chiefly to the 3,000 acres within the 28,000-acre Luquillo Experimental Forest administered by the U.S. Forest Service in eastern Puerto Rico. Tropical and subtropical moist and wet forest between 1,600- and 2,700-foot altitudes. Nests only in Palo Colorado tree which grows between 2,000 and 2,500 feet elevation.

Former distribution: Much wider range in Puerto Rico, including both lowland and upland forest. Became restricted to Sierra de Luquillo by 1930.

Status: Close to extinction because of very small and decreasing numbers. Decrease of 80 to 90 percent in last 16 years, 12 to 20 percent between 1968 and 1970. In 1972 only 16 to 18 birds in the wild.

Estimated numbers: Probably 15 to 20 birds.

Breeding rate in the wild: 2 to 3 eggs. No successful nesting known in 1969 and possibly 2 in 1970.

Reasons for decline: Destruction of habitat for agriculture. Nest predation by rats, pearly-eyed thrashers, and possibly screech owls. Possibly competition with the pearly-eyed thrasher for suitable cavities for nesting sites. Possibly severe storms contribute to decline.

Protective measures already taken: Effort made to transplant these parrots from Luquillo Forest to Toro Negro Unit of the National Forest before 1942, unsuccessful. After an initial survey of the species in 1946 by Ventura Barnes, Jr., of the Fishery and Wildlife Section, Department of Agriculture and Commerce, it was decided that the central part of the Espiritu Santo Valley and the eastern section of the Rio Hicaco be reserved for the protection of this parrot. Studies of nesting and food habits have been conducted on the species through a Federal Aid project W-7-R by Jose Rodriguez-Vidal. Entire Luquillo Experimental Forest, including thousands of acres surrounding the area frequented by the parrots, is a State game refuge, where no hunting is allowed. The Forest Service conducts patrols to detect illegal hunting. Military maneuvers formerly common in the forest have been stopped in all areas frequented by parrots. A cooperative rat control program is being developed to halt predation. Nesting boxes are being installed. Research is being conducted on its population ecology. Aviary for captive propagation being constructed in Luquillo Forest.

Measures proposed: Further studies of entire ecology, including particularly habitat, food requirements, predation, and competition. Test effectiveness of pearly-eyed thrasher and rat control and nesting boxes. Develop captive populations for liberation in other areas.

Number in captivity: Three at Patuxent Wildlife Research Center.

Breeding potential in captivity: Unknown, but other species of Amazona have bred in captivity.

References:

Kepler, C. Administrative reports, Bureau of Sport Fisheries and Wildlife.

Rodriguez-Vidal, J. 1959. The Puerto Rican parrot study, Monographs of the Department of Agriculture and Commerce, Puerto Rico, 1:1-15.

Wadsworth, F. H. U.S. Forest Service, P. O. Box 577, Rio Piedras, Puerto Rico (in lit. 1964).

NEWTON'S PUERTO RICAN SCREECH OWL — Otus nudipes newtoni (Lawrence)

Order: STRIGIFORMES — Family: STRIGIDAE

Distinguishing characteristics: Small, resembing North American screech owl but lacks ear-tufts. In general, brownish gray or reddish brown (two color phases). Flanks and belly lighter, streaked brown and white. Differs from the common subspecies on Puerto Rico (G. n. nudipes) by lighter and more grayish coloration above and more sparse streaking below.

Present distribution: Possibly still exists on St. Croix, Virgin Islands.

Former distribution: Vieques off Puerto Rico, and St. Thomas, St. John and St. Croix of the Virgin Islands.

Status: Apparently never common and little known about it. Special efforts by William Robertson on St. John and by Cameron Kepler on St. Croix failed to find it. George Seaman (in personal communication with Cameron Kepler) says that it may exist in Caledonia Gorge in the forests of northwestern St. Croix. If still extant it must be extremely scarce.

Estimated numbers: No estimate.

Breeding rate in the wild: Unknown.

Reasons for decline: Unknown.

Protective measures already taken: Creation of a National Park at St. John.

Measures proposed: Repeated effort to locate a population of the species so that studies can be made to determine what the limiting factors are.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Bond, J. 1956. Check-list of birds of the West Indies (revised). Acad. Nat. Sci. Phil. p. 81.

_____. 1961. Birds of the West Indies (field guide). Houghton Mifflin Co., Boston, p. 121.

Kepler, C. B. 1969. Administrative report of Bureau of Sport Fisheries and Wildlife on investigations of Puerto Rican parrot ecology and management status of other threatened wildlife species in Puerto Rico and the Virgin Islands.

Ridgway, R. 1914. The birds of North and Middle America. U.S. Nat. Mus. Bull. 50 (Part VI), p. 679.

SPOTTED OWL — Stirix occidentalis (Xantus)

Order: STRIGIFORMES — Family: STRIGIDAE

Distinguishing characteristics: A large, white-spotted, dark brown owl with brown eyes and without ear-tufts. Differs from the similar appearing barred owl of eastern North America in being much more heavily spotted with white all over and particularly on the posterior underparts where the barred owl lacks these markings.

Present distribution: (Divided into three subspecies). Resident in Pacific coastal and Cascade Mountains forests from southwestern British Columbia south to northwestern California; also Sierra Nevada and mountains of southern California; also southern Rocky Mountains from central Colorado, south through eastern Arizona and New Mexico; and mountains of Mexico in Sonora, Michoacan, Guanajuato, and Nuevo Leon.

Former distribution: The same as at present but including some localities from which it is apparently now extirpated in western Texas and Utah.

Status: All three subspecies very uncommon and vulnerable. Widely scattered pairs. Known to be seriously declining in numbers in the heavy forests of western Oregon, Washington, and northwestern California which comprise the range of S. o. caurina.

Estimated numbers: Total population unknown.

Breeding rate in the wild: Two or three (usually two) eggs per set.

Reasons for decline: Removal of old-growth timber--its required habitat, in the Cascades and coast range of the Northwest; disturbance of limited areas of habitat in mountain canyons by recreational and construction activities. Extremely sedentary nature retards movement of birds to new and more favorable habitat when old sites are destroyed.

Protective measures already taken: Some habitat is preserved at lower altitudes in Olympic and Mt. Rainier National Parks. Forest management agencies have been alerted to the incompatability of this species with present forest management practices in the Northwest. A study of the ecology and populations was begun at the Oregon Cooperative Wildlife Research Unit in spring of 1972 in cooperation with the U.S. Forest Service.

Measures proposed: Locate existing breeding pairs. Absolute protection of the environment of known nesting sites in all parts of its range. Preliminary information indicates each pair of S. o. caurina occupies and requires 300 to 600 acres of old-growth timber. Thorough study of its ecological requirements and limiting factors.

Number in captivity: Unknown. One at Oregon State University.

Breeding potential in captivity: Unknown.

References:

Bent, A. C. 1938. Life histories of North American birds of prey (Part 2). U.S. Nat. Mus. Bull. 170: 202-213.

Forsman, E. 1973. in lit.

Johnson, N. K. 1971. in lit.

Marshall, J. T., Jr. 1942. Food and habitat of the spotted owl. Condor 44: 66-67.

Wight, H. M. 1971. in lit.

Wight, H. M. 1972. in lit.

PUERTO RICAN WHIP-POOR-WILL — Caprimulgus noctitherus (Wetmore)

Order: CAPRIMULGIFORMES — Family: CAPRIMULGIDAE

Distinguishing characteristics: Robin-sized night bird with long bristles about the mouth. Variegated mottling of dark brown, black, gray. White band across throat. White spots at end of tail feathers.

Present distribution: Known to occur only in the Guanica Forest, near Guanica on the south coast of Puerto Rico, also Susua Forest and the dry limestone hills north of Tallaboa and Playa de Guayanilla, but south of Penuelas.

Former distribution: Probably in suitable habitat pretty much over entire island.

Status: Rediscovered recently after being considered extinct. It was recently rediscovered by George B. Reynard. The threat to its limited habitat imposed by smelters and refineries is a matter of great concern.

Estimated numbers: Probably not more than 300 pairs in three areas.

Breeding rate in the wild: Nests with two eggs and adults with two young have been found. Breeding season May through July.

Reasons for decline: Probably destruction of habitat and predation by mongoose.

Protective measures already taken: Two of the forests where birds occur set aside as reserves.

Measures proposed: Thorough study of the distribution and ecology of the species determine what its habitat requirements are, how much suitable habitat exists, and what other limiting factors there are. Try to save some of the habitat in limestone hills near Ponce that is threatened with industrial development. More rigid protection of commonwealth forests especially from domestic herbivores (mainly goats) and excessive recreational development and pollution from expanding industry.

Number in captivity: Probably none.

Breeding potential in captivity: Unknown.

References:

Biaggi, V., Jr. University of Puerto Rico at Mayaguez.

Kepler, C. Administrative reports, Bureau of Sport Fisheries and Wildlife.

Leopold, N. F. 1963. Checklist of birds of Puerto Rico and the Virgin Islands. Bull. 168, Univ. Puerto Rico Agric. Exp. Sta.

Reynard, G. B. 1962. The rediscovery of the Puerto Rican Whip-poor-will. The Living Bird, First Annual of Cornell Laboratory of Ornithology.

RED-COCKADED WOODPECKER — Dendrocopos borcalis (Vicillot)

Order: PICIFORMES — Family: PICIDAE

Distinguishing characteristics: Small woodpecker with black and white horizontal stripes on back, white cheeks and under parts, flanks black streaked. Cap and stripe on side of throat and neck black. Male has a small red spot on each side of black cap.

Present distribution: Resident in open, old age pine woodlands from Southeastern Oklahoma, Arkansas, Western Kentucky, Southeastern Virginia south to Gulf Coast and southern Florida.

Former distribution: Southern Missouri, Western Kentucky, and southeastern Virginia, south to Gulf Coast and Southern Florida.

Status: Vulnerable, because of limited number of specialized nesting sites in old, living pines infected with red-heart disease, and current trend in forestry practice to eliminate such trees.

Estimated numbers: Estimate 3,000 to 10,000 but uncommon and very local.

Protective measures already taken: Federal and some State forestry agencies have policies of saving some large pine trees infected with red-heart disease in limited areas where red-cockaded woodpeckers are known to occur.

Measures proposed: Managing blocks of land to provide all necessary habitat requirements.

Number in captivity: None known.

Breeding potential in captivity: Probably poor.

References:

Bent, A. C. 1939. Life histories of North American woodpeckers. U.S. Nat. Mus. Bull. 174: 72-79.

Czuhai, E. 1971. Synoptic review of forest resource and use within the range of the red-cockaded woodpecker. In the Ecology and Management of the Red-cockaded Woodpecker, Proc. Symposium at Okefenokee Nat. Wildlife Refuge, Folkston, Ga. May 26-27, 1971, sponsored by Bureau of Sport Fisheries and Wildlife and Tall Timbers Research Station.

Dennis, J. V. 1972. Red-cockaded woodpecker. National Parks and Conservation Magazine. 46(4): 24-27.

Jackson, J. A. 1971. The evolution, taxonomy, distribution, past populations and current status of the Red-cockaded woodpecker. In The Ecology and Management of the Red-cockaded Woodpecker, Proc. Symposium at Okefenokee Nat. Wildlife Refuge, Folkston, Ga. May 26-27, 1971, sponsored by Bureau of Sport Fisheries and Wildlife and Tall Timbers Research Station.

Lay, D. W., and D. N. Russell. 1970. Notes on the Red-cockaded woodpecker in Texas. Auk 87: 781-786.

Morse, D. 1972. Habitat utilization of the red-cockaded woodpecker during the winter. Auk 89: 429-434.

Thompson, R. L. and W. W. Baker. 1971. A survey of red-cockaded woodpecker habitat requirements. In The Ecology and management of the red-cockaded woodpecker, Proc. Symposium at Okefenokee Nat. Wildlife Refuge, Folkston, Ga. May 26-27, 1971, sponsored by Bureau of Sport Fisheries and Wildlife and Tall Timbers Research Station.

AMERICAN IVORY-BILLED WOODPECKER — Campehilus p. principalis (Linnaeus)

Order: PICIFORMES — Family: PICIDAE

Distinguishing characteristics: A very large woodpecker, larger than a crow, with a white bill, large patches of white on wings, and white lines on either side of neck. Male with red, female with black crest. Differs from pileated woodpecker in having a white rather than dark bill and much more white in wings which shows when not in flight. Flight level not looping as in pileated woodpecker. Call a single note like the sound of a toy tin horn.

Present distribution: Only recent records are for SE Texas, southern Louisiana and central South Carolina. Considerable effort has failed to produce reliable records elsewhere in its former range.

Former distribution: Resident in southeastern United States from southeastern Oklahoma, northeastern Arkansas, southeastern Missouri, southeasten Illinois, and southeastern North Carolina, southward to the Gulf coast of eastern Texas, eastward to southern Florida.

Status: Probably very close to extinction because of scarcity of suitable habitat.

Estimated numbers: No basis for estimating total numbers.

Breeding rate in the wild: 3 to 5 eggs per year.

Reasons for decline: Reduction of overmature forests with dead and dying trees which supply the wood boring beetle larvae required for food. Illegal shooting may also be a factor.

Protective measures already taken: Strict legal protection including prohibition of collection for scientific purposes. Search for birds and suitable habitat as first step in planning appropriate conservation measures conducted by the Bureau of Sport Fisheries and Wildlife from 1965 to 1968, and likely reports are being checked. Two timber management compartments at the St. Marks National Wildlife Refuge (Florida) have been selected for management in an effort to provide suitable habitat for ivory-billed woodpeckers which might be living in the area.

Measures proposed: Widescale search to locate remaining birds with help of playing of sound recordings and aerial reconnaissance. Education to aid in proper identification of bird and to prevent thoughtless shooting. Preservation of habitat, especially effort to save scattered mature bottom land hardwoods. Publicity to inform public of the birds' needs, habits, and general whereabouts.

Number in captivity: Probably none.

Breeding potential in captivity: Unknown.

References:

Agey, H. N. and G. M. Heinzman. 1971. The ivory-billed woodpecker found in central Florida. Florida Naturalist, 44(2): 46-47 & 64.

Dennis, J. Administrative reports, Bureau of Sport Fisheries and Wildlife.

Eastman, W. 1958. Ten-year search for the ivory-billed woodpecker. Atlantic Naturalist 13: 216-228.

Sykes, P. Administrative reports, Bureau of Sport Fisheries and Wildlife.

Tanner, J. T. 1942. The ivory-billed woodpecker, Research Report No. 1 of the National Audubon Society, 111 pp.

HAWAIIAN CROW (ALALA) — Corvus tropicus (Gmelin)

Order: PASSERIFORMES — Family: CORVIDAE

Distinguishing characteristics: All black, like American crows but duller, tinged with brown, especially on wings and with more massive bill. Higher pitched voice.

Present distribution: Resident locally in forested areas and higher elevations on North and South Kona and Kau Districts of the island of Hawaii, including ranching country.

Former distribution: Same as present but more generally distributed from Kau to Puuwaawaa from 1,000 to 8,000 feet elevation.

Status: Greatly reduced from former numbers and continuing to decline.

Estimated numbers: About 50. In May, 1972, 17 seen by Bureau of Sport Fisheries and Wildlife and Hawaii Division of Fish and Game personnel on slopes of Mt. Hualalai, Hawaii.

Breeding rate in the wild: Unknown; however, a nest with two young found.

Reasons for decline: Shooting. Alteration of environment by modern man, especially destruction. Possibly avian diseases. Destruction of native forest by domestic livestock.

Protective measures already taken: Protected by State and Federal law. Status and ecological study initiated.

Measures proposed: Preservation of natural environment and establishment of needed refuges and sanctuaries. Initiate propagation program and develop techniques for stocking suitable habitat. Increase patrol and/or law enforcement effort. Intensify ecological and life history research of the species. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction to disease. Control or elimination of grazing by feral grazing animals and domestic livestock in key habitat areas.

Number in captivity: One at Patuxent Wildlife Research Center.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.
Fisher, J., and R. T. Peterson. 1964. World of birds.
Hawaii Division of Fish and Game Administrative Reports.
Munro, G. C. 1960. Birds of Hawaii. Charles E. Tuttle Co., Rutland, Vermont, and Tokyo, Japan. 192 pp.

SMALL KAUAI THRUSH (PUAIOHI) — Phaeornis palmeri (Rothschild)

Order: PASSERIFORMES — Family: TURDIDAE

Distinguishing characteristics: Upper parts dull brown, head darker, a white mark over eye; underpart grayish, abdomen white. Differs from a similar Hawaiian thrush in smaller size and flesh-colored (not dark) legs, and white mark over eye.

Present distribution: Unknown. Observed in Alakai Swamp on island of Kauai of Hawaii.

Former distribution: Unknown. Very few widely separated records in the native forests of Kauai.

Status: Vulnerable because of extremely restricted distribution. Exotic plants becoming established in Alakai Swamp. Proposal for power and irrigation dam and reservoir on edge of swamp.

Estimated numbers: Unknown, but probably very low.

Breeding rate in wild: Unknown.

Reasons for decline : Destruction of native forests, but has always been rare according to early collectors.

Protective measures already taken: Protected by State and Federal law. Selective limitation by State and Federal Governments of introduction of foreign species. Establishment of the 10,000-acre Alakai Swamp Wilderness Preserve by Hawaii State regulation which prohibits disturbance of the required habitat. Ecological and life history studies begun.

Measures proposed: Preservation of natural environment, including establishment of permanent needed refuges. Control predators. Prevent introduction of harmful insects, plants, and animals. Control of feral grazing animals. Intensify ecological and life history research of the species. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate propagation program to develop techniques that could be applied to this and other Hawaiian forest birds.

Number in captivity: One female in Honolulu Zoo since 1968.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.
Fisher, J., and R. T. Peterson. 1964. World of Birds.
Hawaii Division of Fish and Game Administrative Reports.
Munro, G. C. 1960. Birds of Hawaii. Charles E. Tuttle Co., Rutland, Vermont, and Tokyo, Japan. 192 pp.
Richardson, F., and J. Bowles. 1964. A survey of the birds of Kauai, Hawaii. Bernice P. Bishop, Museum Bull. 227, 51 pp.

LARGE KAUAI THRUSH (KAUAI OMAO) — Phaeornis obscurus myadestina (Stejneger)

Order: PASSERIFORMES — Family: TURDIDAE

Distinguishing characteristics: Dark brown upper parts, gray underparts; plump. Differs from the Small Kauai Thrush in larger size, plump appearance, and dark (not flesh colored) legs; lacks white mark over eye. Has habit of trembling.

Present distribution: Most often observed in Alakai Swamp on island of Kauai, Hawaii.

Former distribution: Reportedly the most common forest bird in all forests of Kauai in 1891.

Status: Restricted distribution and small numbers. Power and irrigation dam proposed on edge of Alakai Swamp.

Estimated numbers: Unknown--but presently low.

Breeding rate in the wild: Unknown.

Reasons for decline: Encroachment of civilization, including feral grazing animals, on its specialized habitat with reduction of heavy forest. Also possibly the effect of introduced diseases and their insect vectors or competition from introduced birds.

Protective measures already taken: Protected by State and Federal law. Selective limitation by State and Federal Governments of introduction of foreign species. Establishment of the 10,000-acre Alakai Swamp Wilderness Preserve by Hawaii State regulation which prohibits disturbance of the major habitat. Ecological and life history studies begun.

Measures proposed: Preservation of natural environment and establishment of needed refuges and sanctuaries. Control predators. Prevent introduction of harmful insects, plants, and animals. Inspection and fumigation of all arriving aircraft and ships. Control of feral grazing animals. Initiate propagation program to develop techniques which may be applied to this and other Hawaiian forest birds. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds, brought into the State to prevent introduction of disease. Intensify research. Initiate propagation program to develop techniques that could be applied to this and other Hawaiian forest birds.

Number in captivity: Probably none.

Breeding potential in captivity: Unknown.

References:

Berger, A. J. 1970. The present status of the birds of Hawaii. Pac. Sci. 24(1): 29-42.

Bureau of Sport Fisheries and Wildlife Administrative Reports.

Munro, G. C. 1960. Birds of Hawaii. Charles E. Tuttle Co., Rutland, Vermont, and Tokyo, Japan. 192 pp.
Richardson, F. and J. Bowles. 1964. A survey of the birds of Kauai, Hawaii. Bernice P. Bishop, Museum Bull. 227, 51 pp.

MOLOKAI THRUSH (OLOMAU) — Phaeornis obscurus rutha (Bryan)

Order: PASSERIFORMES — Family: TURDIDAE

Distinguishing characteristics: Plump bird, dark brown above, unspotted gray underparts. Has habit of trembling.

Present distribution: Confined as far as known to higher portions of native forest of eastern Molokai, Hawaii.

Former distribution: Widely distributed in all native wet forests on Molokai.

Status: Threatened primarily because very rare and restricted range. Thought to have become extinct between 1907 and 1936 (Greenway), but rediscovered by Noah Pekelo, Jr., who saw two at Puu Haha, July 17, 1963.

Estimated numbers: Very low.

Breeding rate in the wild: No information.

Reasons for decline: Introduction of foreign birds, avian diseases, and insect vectors; elimination and alteration of natural forest by man and introduced ungulates, including domestic livestock.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign species of birds.

Measures proposed: More complete control of introduction of foreign species of birds and mammals and reduction of those already present in range of this species. Restoration and protection of natural forest habitat, including establishment of needed refuges. Initiate ecological and life history research to determine particular ecological requirements and limiting factors of this species. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate propagation program to develop techniques that may be applied to this and other Hawaiian forest birds.

Number in captivity: None.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.

Greenway, J. C., Jr. 1958. Extinct and vanishing birds of the world. Spec. Pub. 13 Amer. Committee for International Wild Life Protection. New York, New York, p. 287.

Hawaii Division of Fish and Game Administrative Reports.

Munro, G. C. 1960. Birds of Hawaii.

Pekelo, N. 1963. Nature notes from Molokai. Elepaio 24(4): 17-18.

Richardson, F. 1949. Status of native land birds on Molokai. Pac. Sci. 3(3). 226-330.

NIHOA MILLERBIRD — Acrocephalus kingi (Wetmore)

Order: PASSERIFORMES — Family: SYLVIIDAE

Distinguishing characteristics: A small, plain bird, smaller than a sparrow with a thin, warbler-type bill; gray-brown above and buffy white below.

Present distribution: Confined to Nihoa Island in the Hawaiian Islands National Wildlife Refuge in the Northwestern Hawaiian Islands.

Former distribution: Same as present.

Status: Vulnerable because of very small population and extremely restricted geographical distribution (174 acres).

Estimated numbers: About 400 in September, 1972, by Bureau of Sport Fisheries and Wildlife personnel. Fluctuates from 300 to 600 for unknown reasons.

Breeding rate in the wild: Two or three eggs per clutch.

Reasons for decline: Not known to be declining and no reason known at present why it should.

Protective measures already taken: Protected by State and Federal law. Its entire range is within the Hawaiian Islands National Wildlife Refuge and thus is protected. Landings on islands restricted and by permit only. Life history study begun. Publicity of refuge status in news media. Status of refuge and need for entry permit included in current nautical charts of area and U. S. Coast Pilot.

Measures proposed: Preservation of natural environment. Prevent introduction of harmful insects, plants, and animals. Initiate experimental artificial propagation program. Introduction into new range. Increase patrol. Continue ecological and life history research of the species. Continue to publicize critical status and aesthetic and scientific values.

Number in captivity: None.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.
Wetmore, A. 1924. A warbler from Niboa. Condor 26: 177-178.

KAUAI OO (OO AA) — Moho braccatus (Cassin)

Order: PASSERIFORMES — Family: MELIPHAGIDAE

Distinguishing characteristics: A slender, sooty bird, with slender black bill, white streaks on throat, yellow thighs, white wing patch and pointed tail.

Present distribution: Confined to island of Kauai in Hawaii. Very local. Known to occur in the Alakai Swamp. Richardson and Bowles (1964) were able to locate at least 12 individuals on July 21, 1960 in Alakai Swamp. Sincock (1971) found a pair at nesting cavity in dead Ohia tree on May 31, 1971, near Mt. Waialeale, and saw six same area in 1972.

Former distribution: Generally distributed in the heavy forest of Kauai.

Status: Population greatly depleted. Irrigation and power dam and reservoir on edge of Alakai Swamp is proposed.

Estimated numbers: Total number unknown, but apparently very few.

Breeding rate in the wild: Two young in nest found by Sincock.

Reasons for decline: Encroachment of civilization on its specialized habitat with reduction of heavy forest. Also possibly the effect of introduced diseases and disease-carrying insects.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introductions of foreign species of birds. Establishment of the 10,000 acre Alakai Swamp Wilderness Preserve by Hawaii State regulation which prohibits disturbance of the major habitat. Research in ecology and life history in progress.

Measures proposed: Preservation of natural environment including establishment of needed refuges. Prevent introduction of harmful insects, plants, and animals. Control of feral grazing animals. Continue ecological and life history research of the species. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate propagation program to develop techniques applicable to other forest birds.

Number in captivity: None known.

Breeding potential in captivity: Unknown, but probably poor.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.
Hawaii Division of Fish and Game Administrative Reports.
Munro, G. C. 1960. Birds of Hawaii.
Richardson and Bowles. 1964. A survey of the birds of Hawaii. Bernice P. Bishop Museum Bull. 227.
Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna.

BACHMAN'S WARBLER — Vermivora bachmanii (Audubon)

Order: PASSERIFORMES — Family: PARULIDAE

Distinguishing characteristics: Very small bird with fine bill; male olive green above; face and underparts yellow; throat-patch and crown-patch black. Female lacks black throat; upper parts olive green; forehead and underparts yellow; crown grayish.

Present distribution: Known only from recent (since 1950) observation of nonbreeding individuals near Lawton, Virginia, and Charleston and Francis Marion National Forest, South Carolina and three localities in Alabama.

Former distribution: Bred in river swamp forests of southeastern Missouri, northeastern Arkansas, western Kentucky, central Alabama, and South Carolina. Migrated through gulf states and Florida to winter in Cuba.

Status: So infrequently seen that nothing is known of its present breeding or wintering distribution. Only an occasional nonbreeding individual observed.

Estimated numbers: No estimates.

Breeding rate in the wild: Three to five eggs to a set.

Reasons for decline: Obscure. Possibly the cutting of practically all the virgin swamp or bottomland timber in the Southeast. Excessive collecting along restricted migration route in Florida may have caused decline in earlier years.

Protective measures already taken: Protected by Federal law since revision of interpretation of provisions of the Migratory Bird Treaty Act in 1965, also by the laws of States in which it formerly occurred. Some of the National Wildlife Refuges in the Southeast have river swamp forests which may be potential habitat for this species.

Measures proposed: An intensive study to locate breeding Bachman's warblers and to learn what their requirements are so that further protective measures can be taken. Complete protection from collecting anywhere.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References:

Bent, A. C. 1953. Life histories of North American wood warblers. U.S. National Museum Bulletin 203.

Imhof, T. A. 1962. Alabama Birds. University of Alabama Press. 591 pp.

Meanley, B. Manuscript of account of species for the Handbook of North American birds.

GOLDEN-CHEEKED WARBLER — Dendroica chrysoparia (Schlater and Salvin)

Order: PASSERIFORMES — Family: PARULIDAE

Distinguishing characteristics: Smaller than sparrow. Male with bright yellow cheeks and with black throat, back and line through the eyes. Female similar but back olive.

Present distribution: Breeds only in mature growth "cedar breaks" of the Edwards Plateau of central Texas; also northeast to Dallas and Palo Pinto counties. Exact winter range unknown. A few observations in winter in the highlands of Guatemala, Nicaragua, and Honduras (Pulich 1962 and 1969); also Tamaulipas, Mexico (Evenden 1965).

Former distribution: Same as present.

Status: Vulnerable because of very specialized and restricted habitat, although common in such areas of mature cedar (Juniperus ashei) 25-40 feet high. Loss of this type of habitat has resulted in disappearance of the species in many places. Current trends in brush removal and urbanization in breeding areas, if accelerated could jeopardize the species in a short time.

Estimated numbers: Pulich (1969) estimated about 15,000 to 17,000 in total population.

Breeding rate in the wild: One set of 3 to 5 eggs per year.

Reasons for decline: Removal of mature stands of Ashe juniper for brush eradication to increase growth of grass and expansion of urbanization into the limited nesting range of the species.

Protective measures already taken: Strictly protected by Federal law. Court ruling to protect one breeding area from development as a golf course.

Measures proposed: Preservation of mature stands of Juniperus ashei through acquisition or lease of land. Further study of wintering areas to determine exact range and any limiting factors that may exist there. Eliminate brush clearing in key habitats.

Number in captivity: None.

Breeding potential in captivity: Poor.

References:

Evenden, F. (in litt. 1965)

Pulich, W. M. 1962. In quest of the golden-cheeked warbler--some preliminary findings. Newsletter of the Texas Ornithological Society, 10: 5-11.

_____. 1969. Golden-cheeked warbler: threatened bird of the cedar Brakes. National Parks Mag. March 1969, 10-12.

KIRTLAND's WARBLER — Dendroica kirtlandii (Baird)

Order: PASSERIFORMES — Family: PARULIDAE

Distinguishing characteristics: Small bird with finely pointed bill. Bluish gray above with black streaks on back. Male has black mask, is pale yellow below with distinct dark streaks on sides of breast. Female is duller and lacks mask. In fall plumage, face, sides, and upper parts heavily obscured with brown. Habit of bobbing tail at all times.

Present distribution: Breeds in the northern part of the lower peninsula of Michigan from Lake Huron west to Kalkaska County and from Presque Isle County south to Ogemaw County principally in watershed of the AuSable River. Nesting habitat young jack pines with low brushy undergrowth. Winters in the Bahama Islands. Recent records from Eleuthera, New Providence, and Grand Bahama, 5 in 1964. Winter habitat noted as pine woods, broad-leafed scrub, and Australian pine (Casuarina).

Former distribution: Perhaps more extensive breeding area. Winter specimens taken on 10 of the Bahama Islands between 1879 and 1915. Early observers noted winter habitat as broad-leafed scrub.

Status: Vulnerable due to small numbers, limited geographical range, exacting breeding habitat requirements, and increasing parasitism by cowbirds.

Estimated numbers: Less than 300 pairs.

Breeding rate in the wild: Usually lays 5 eggs in first set and 4 in replacement sets. Two records of two successful nestings in one season by same pair, but may be more often.

Reasons for decline: Population may fluctuate with varying amounts nesting habitat. Parasitism of cowbirds thought a probable limiting factor to production. Nothing known of limiting factors on wintering grounds.

Protective measures already taken: The U.S. Forest Service has set aside 4,010 acres of National Forest to be managed to provide optimum nesting habitat for Kirtland's warbler. Prescribed burning is being used in this area to create the young jack pine stands needed. The Michigan Conservation Department has established three Kirtland's Warbler Management Areas, each of 4 square miles, on State forest land. Michigan Audubon Society is cooperating with U.S. Forest Service in planting jack pines on burned areas where natural reproduction is not occurring. Dr. Nicholas Cuthbert studied and controlled cowbirds with favorable results. Kirtland's Warblers are strictly protected by State and Federal laws. National Audubon Society has recently underwritten an assessment of the winter status of this bird. Florida Audubon Society has attempted to get protection for areas where birds observed in Bahamas. The third decennial census of this species for 1971 organized by Harold Mayfield.

Measures proposed: More study of the wintering areas in the Bahamas to determine the habitat requirements and possible limiting factors there which might be controlled. Obtain protection for wintering areas where birds have been seen recently. Expand protected breeding areas. Continue control of cowbird parasitism of Kirtland's warbler nests. Continue study of jack pine reproduction and ecology at North Central Forest Experimental Station.

Number in captivity: None known.

Breeding potential in captivity: Unknown but probably poor.

References:

Anonymous. 1972. Trouble for Michigan bird of fire. Audubon. 74: 34-35.

Blanchard, D. 1965. Kirtland's warbler in winter on Grand Bahama. Jack Pine Warbler 43: 39-42.

Handley, M. N. 1967. Recent wintering records of the Kirtland's warbler. Auk 84: 425-426.

Mason, C. R. Florida Audubon Society, Altamonte Springs, Florida, in lit. 1964.

Mayfield, H. 1960. The Kirtland's warbler. Cranbrook Institute of Science. 242 pp.

_____. 1963. Establishment of preserves for the Kirtland's warbler in the state and national forests of Michigan. Wilson Bull. 75: 216-220.

_____. 1972. Third decennial census of Kirtland's warbler. Auk 89: 263-268.

Radtke, R. and J. Byelich. 1963. Kirtland's warbler management. Wilson Bull. 75: 208-215.

Von Bergen, J. 1969. Kirtland's report. Michigan Audubon Newsletter 17: 3.

Wallace, G. J. 1968. Another August record of Kirtland's warbler on its winter grounds. Jack Pine Warbler 46: 7.

ELFIN WOODS WARBLER — Dendroica angelae (Kepler and Parkes)

Order: PASSERIFORMES — Family: PARULIDAE

Distinguishing characteristics: A small warbler, generally black above, white below, the chest, breast, and belly spotted with triangular dots. Laterally shows prominent white eye ring, two curved white arcs on nape and post-auriculars, two white wing bars, and a white wing "speculum."

Present distribution: Very restricted, confined to about 1,000 acres of Elfin Woodland forest on the peaks of El Yunque, El Toro, and East Peak, Luquillo Forest, eastern Puerto Rico.

Former distribution: Probably same as present although some habitat recently destroyed.

Status: Very small population in extremely restricted geographical distribution (1,000 acres).

Estimated numbers: Probably does not exceed 300 pairs.

Breeding rate in wild: Unknown. Pairs with one to three young have been seen in June and July.

Reasons for decline: Not definitely known to be declining but habitat destruction on East Peak may have destroyed 5 percent of the total habitat.

Protective measures already taken: The entire known range lies within Luquillo Experimental Forest, administered by the U.S. Forest Service, which is also a bird refuge. The Elfin Woodland can be reached only on foot or through restricted roads that are kept locked with vehicular access by permit only.

Measures proposed: The Elfin Woodland and adjacent forests of El Toro, El Cacique, East Peak, West Peak, and parts of El Yunque be declared "Endangered Species Areas" by the Forest Service, U.S. Department of Agriculture which maintains jurisdiction of the Luquillo Forest. No development within this area. Strict regulation of museum collecting of the species. Initiate ecological and life history research on the species.

Number in captivity: None.

Breeding potential in captivity: Unknown but probably poor.

References:

Kepler, C. B. and K. C. Parkes. 1972. A new species of warbler (Parulidae) from Puerto Rico. Auk 89:1-18.
Wildlife.

CRESTED HONEYCREEPER (AKOHEKOHE) — Palmeria dolei (Wilson)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: A medium-sized perching bird, generally black, with orange-tipped feathers above and below; patch of reddish-orange feathers at back of neck; prominent gray or white crest on forehead.

Present distribution: Very restricted; confined to rain forests on the northeast slopes of Haleakala between 6,000 and 7,000 feet, Island of Maui, Hawaii.

Former distribution: Mountain forests of Molokai and Maui, Hawaii.

Status: Vulnerable because of very limited distribution and numbers. Seen by a number of ornithologists in 1965-67 near Wai Anapanapa and Puu Alaea and in upper Kipahulu Valley, Maui. Habitat very limited.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Probably adversely affected by introduced birds diseases and encroaching civilization on the forest habitat. Noted to have deserted forests opened by invasion of cattle.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign bird species. Acquisition and protection of large area in Kipahulu Valley, Maui, by The Nature Conservancy for inclusion in Haleakala National Park as a wilderness area.

Measures proposed: Preservation of additional natural environment, including establishment of needed refuges. Prevent introduction of harmful insects, plants, and animals. Control of feral grazing animals. Initiate ecological and life history research of the species. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate propagation program and develop techniques which may be applied to Hawaiian forest birds.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports
Greenway, J. C. 1958. Extinct and vanishing birds of the world.
Hawaii Division of Fish and Game Administrative Reports.
Munro, G. C. 1960. Birds of Hawaii.

KAUAI AKIALOA — Hemignathus procerus (Cabanis)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: A bright greenish-yellow bird with an extremely long sickle-like bill, about a third the total length of the bird.

Present distribution: The upper rain forest island of Kauai, Hawaii. Known at present to occur only in the Alakai Swamp.

Former distribution: Generally distributed in the heavily forested regions of Kauai.

Status: Very rare in restricted and vulnerable habitat. Exotic plants becoming established and power and irrigation dam proposed on edge of Alakai Swamp.

Estimated numbers: Total unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Possibly introduced avian diseases and parasites. Alteration of habitat by invasion by foreign plants or browsing by feral and domestic animals.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign birds. Establishment of the 10,000 acre Alakai Swamp Wilderness Preserve by Hawaii State regulation which prohibits disturbance of the major habitat. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Restoration and preservation of natural forest conditions of only known area of forest where species occur and establishment of wildlife refuge and sanctuaries. Continue ecological and life history research. Prevent introduction of harmful insects, plants, and animals. Control of feral grazing animals and domestic stock. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate propagation program or develop techniques which could be applied to Hawaiian forest birds.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.
Hawaii Division of Fish and Game Administrative Reports.
Munro, G. C. 1960. Birds of Hawaii.
Richardson and J. Bowles. 1964. A survey of the birds of Kauai, Hawaii. Bishop Museum Bull. 227.
Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. Condor 70: 101-120.

KAUAI NUKUPUU — Hemignathus lucidus hanapepe (Wilson)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Small bird with upper parts and breast yellow, white on abdomen; feet slately black. Long, down-curved bill with upper mandible twice length of lower. Female smaller and duller colored than male.

Present distribution: The upper rain forest of the island of Kauai, Hawaii. Known to occur at present only in the Alakai Swamp.

Former distribution: Probably more generally distributed than at present, but seldom seen below 4,000 feet elevation (Munro, 1960).

Status: Very rare in restricted vulnerable habitat. Exotic plants becoming established and power dam proposed on edge of Alakai Swamp.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Possibly introduced avian diseases with insect vectors and destruction of habitat.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign species of birds. Establishment of the 10,000-acre Alakai Swamp Wilderness Preserve by Hawaii State regulation which prohibits disturbance of the major habitat. Limited field investigations in progress.

Measures proposed: Restoration and preservation of native forest habitat and establishment of wildlife refuges or sanctuaries, and exclusion of human and domestic animal interference in area where known to exist at present. Initiate propagation program and develop techniques applicable to Hawaiian forest birds. Initiate ecological and life history research. Prevent introduction of harmful insects, plants, and animals. Control of feral grazing animals. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports
Hawaii Division of Fish and Game Administrative Reports
Munro, G. C. 1960. Birds of Hawaii.
Richardson, F., and J. Bowles. 1964. A survey of the birds of Kauai. Bishop, Museum Bull. 227 pp.
Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. Condor 70: 101-120.

MAUI NUKUPUU — Hemignathus lucidus affinis (Rothschild)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Small bird with long down-curved bill; upper mandible twice length of lower. Under parts and head bright yellow, back olive green. Females and immatures are duller below with olive crown, yellow throat, and yellow stripe above the eye.

Present distribution: Known to occur from 5,500 to 6,500 feet northeast slopes of Haleakala Crater, island of Maui, Hawaiian Islands. Two, possibly three seen in Kipahulo Valley in August 1967 (Banko).

Former distribution: Historically reported in forests at about 4,000 feet elevation, Maui.

Status: Very uncommon.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Alteration of natural environment by man. Probable susceptibility to exotic avian diseases transmitted by introduced mosquitoes.

Protective measures already taken: Protected by State law. Selective limitation of introduced foreign species of birds. Limited field research program in progress. Acquisition of large area of Kipahulu Valley, Maui, by the Nature Conservancy for inclusion as wilderness area in Haleakala National Park.

Measures proposed: Preservation in natural condition the native rain forest environment in Kipahulu Valley and other areas and establishment of refuges or sanctuaries. Prevent introduction of harmful insects, plants, and animals. Control of feral grazing animals. Control of domestic stock. Initiate ecological and life history research of the species. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate propagation program and develop techniques applicable to Hawaiian forest birds.

Number in captivity: None.

Breeding potential in captivity: Unknown.

References:

Amadon, D. 1950. The Hawaiian Honeycreepers. Bul. Am. Mus. Nat. Hist., Vol. 95, Art. 4.

Banko, W. E. 1968. Re-discovery of Maui Nukupuu, Hemignathus lucidus affinis, and sighting of Maui Parrotbill, Pseudonestor xanthophrys, Kipahulu Valley, Maui, Hawaii. Condor 70:265-266.

Greenway, J. C., Jr. 1958. Extinct and Vanishing Birds of the World.
Hawaii Division of Fish and Game Administrative Reports.
Munro, G. C. 1960. Birds of Hawaii.
Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. Condor 70: 101-120.

AKIAPOLAAU — Hemignathus wilsoni (Rothschild)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Small bird with head and breast yellow; upper parts olive green; abdomen dull yellow. Long, down-curved upper mandible, lower mandible, short and straight.

Present distribution: Confined to upper forests of Mauna Kea and Mauna Loa, island of Hawaii. Three sightings in the Kilauea Koa Forest made in 1970 by Banko. Seen in recent years in mamane forest of Mauna Kea by Andrew S. Berger. Seen in very small numbers by various observers in 1972 in Keahou Forest Reserve on island of Hawaii.

Former distribution: Much more widely distributed and more numerous than at present.

Status: Now nonexistent or very uncommon over wide range of upper forests.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Introduction of foreign birds, avian diseases, and insect vectors; elimination and alteration of natural forest by man and introduced ungulates, including domestic livestock and feral sheep and goats.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign species of birds. Limited field investigations are underway to develop guidelines for action programs.

Measures proposed: More complete control of introduction of foreign species of birds and mammals and reduction of those already present in range of this species. Restoration and protection of natural forest habitat and establishment of wildlife refuges. Study of ecological requirements and limiting factors. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate propagation program and develop techniques that could be applied to Hawaiian forest birds.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

Banko, W. 1970. in lit.

Bureau of Sport Fisheries and Wildlife Administrative Reports.

Hawaii Division of Fish and Game Administrative Reports.

King, W. B. and D. Bratley. 1964. Birds on Hawaii's "Big Island" Elepaio 25(2): 8.

Munro, G. C. 1960. Birds of Hawaii.

Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. Condor 70: 101-120.

HAWAII AKEPA (AKEPA) — Loxops coccinea coccinea (Gmelin)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Small bird with short, light colored, pointed bill. Males are bright reddish orange, somewhat duller on the back and with dusky wings and tail. Females greenish-yellow below, olive or yellowish green above.

Present distribution: Confined to very limited areas of native forests and widely scattered on Mauna Kea, Mauna Loa and Hualalai on the island of Hawaii.

Former distribution: Same as present but much more widespread. Found in all native forests according to Munro.

Status: Appears in very small numbers. Populations declining. Only four seen in recent years despite intensive search by Winston Banko in formerly occupied habitats. About a dozen were seen by him April, 1971 in Kaalaa, Kau District.

Estimated numbers: No estimate, but very low.

Breeding rate in the wild: Unknown.

Reasons for decline: Introduction of foreign birds, avian diseases, and insect vectors. Elimination and alteration of native forest by man and introduced ungulates, including domestic livestock and feral goats.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Government of introduction of foreign species of birds. Field investigations are underway to develop guidelines for action programs.

Measures proposed: Preservation of natural environment and establishment of wildlife refuges. Control of domestic and feral grazing animals. Conduct ecological and life history research of the species. Publicize critical status and aesthetic and scientific values. Quarantine on all birds including cage birds brought into the State to prevent introduction of disease. Captive propagation and develop techniques applicable to Hawaiian forest birds.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Amadon, D. 1950. The Hawaiian Honeycreepers (Aves, Drepaniidae). Bull. Amer. Mus. Nat. Hist. 95: 155-262.

Bureau of Sport Fisheries and Wildlife Administrative Reports

Hawaii Division of Fish and Game Administrative Reports.

Munro, G. C. 1960. Birds of Hawaii. Ridgeway Press. Revised Edition.

MAUI AKEPA (AKEPUIE) — Loxops coccinea ochracea (Rothschild)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Small bird with short sharp-pointed bluish gray bill. Some males are dull brownish orange or ochraceous, others are dull yellow washed with olive above or intermediate between these two extreme color types. Females are yellowish below and olive green above being duller and less yellowish than females of the Hawaii akepa.

Present distribution: If extant, confined to windward forest of Haleakala, island of Maui, Hawaii.

Former distribution: More widely distributed in native forest than at present.

Status: Could possibly be extinct. Three birds reported between 2,000 and 3,000 feet on the south slope of Haleakala on November 24, 1950, appear to be only records since 1894 (Richards and Baldwin, 1953).

Estimated numbers: No estimate.

Breeding rate in the wild: Unknown. No record of eggs or nestlings.

Reasons for decline: Probably the effect of encroachment of civilization on the native forest habitat, introduced diseases, and disease-carrying insects.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign species of birds. Field investigations are underway to develop guidelines for action programs.

Measures proposed: More complete control of introduction of foreign species of birds and mammals and reduction of those already present in range of this species. Restoration and protection of natural forest habitat. Initiate or continue ecological and life history research particularly to determine ecological requirements and limiting factors. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State, to prevent introductions of disease.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Munro, G. C. 1960. Birds of Hawaii.

Richards, L. P. and P. H. Baldwin. 1953. Recent records of some Hawaiian honeycreepers. Condor 55: 221-222.

OAHU CREEPER (ALAUWAHIO) — Loxops maculata maculata (Cabanis)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Small bird with straight, slender, sharp-pointed bill. Male yellow below and yellow washed with olive green above, duskier on wings and tail. Female somewhat duller. Adults retain white wing-bars which are only present in juvenal plumage of other subspecies.

Present distribution: Confined to higher elevations of native forests of the island of Oahu, Hawaii.

Former distribution: Same as present but more widespread.

Status: Very small and declining numbers.

Estimated numbers: No estimate but very low.

Breeding rate in the wild: Unknown.

Reasons for decline: Introduction of foreign birds, avian diseases, and insect vectors; alteration of native forests by man and introduced ungulates.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign species of birds. Limited field investigations in progress.

Measures proposed: More complete control of introduction of foreign species of birds and mammals and reduction of those already present in range of this species. Restoration and protection of natural forest habitat, including establishment of needed refuges. Conduct ecological and life history research to determine ecological requirements and limiting factors for this species. Publicize critical status and aesthetic and scientific values. Quarantine on all birds including cage birds brought into the State to prevent introduction of disease. Initiate propagation program and/or develop techniques which may be applied to Hawaiian forest birds.

Number in captivity: None.

Breeding potential in captivity: Unknown.

References:

Amadon, D. 1950. The Hawaiian honeycreepers. Bull. Amer. Mus. Nat. Hist. 95: 155-262.

Bureau of Sport Fisheries and Wildlife, Administrative Reports.

Hawaii Division of Fish and Game, Administrative Reports.

Munro, G. C. 1960. Birds of Hawaii.

MOLOKAI CREEPER (KAKAWAHIE) — Loxops maculata flammea (Wilson)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Small bird, males bright scarlet with brownish wing and tail, females dull brownish gray becoming almost white below and sparingly washed with pinkish buff, young males resemble females or are in partially scarlet plumage.

Present distribution: Endemic to island of Molokai where it is restricted to boggy forests of the eastern mountains.

Former distribution: Known only from the above area.

Status: Exists in extremely small numbers. Thought to be extinct prior to 1961 sightings. Seen also in 1962 and 1963 (Pekelo, 1963).

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Alteration of natural environment by man through clearing and grazing by domestic livestock and introduced goats and Axis deer. Probable susceptibility to exotic avian disease.

Protective measures already taken: Protected by State law. Selective limitation of introduced foreign species of birds. Field research program underway to determine status and base guidelines for future conservation action.

Measures proposed: Preservation of natural environment, including establishment of needed refuges. Prevent introduction of harmful insects, plants, and animals. Control of feral grazing animals and livestock. Initiate ecological and life history research. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate propagation program and develop techniques applicable to Hawaiian forest birds.

Number in captivity: None.

Breeding potential in captivity: Unknown.

References

Amadon, D. 1950. The Hawaiian Honeycreepers. Bull. Am. Mus. Nat. Hist., Vol. 95, Art. 4.

Bureau of Sport Fisheries and Wildlife Administrative Reports

Hawaii Division of Fish and Game Administrative Reports

Munro, G. C. 1944. Birds of Hawaii.

Pekelo, N., Jr. 1963. Some notes from Molokai. Elepaio 23(12):64.

MAUI PARROTBILL — Pseudonestor xanthophrys (Rothschild)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Small, olive green bird with yellow breast and yellow stripe over eye. Heavy parrot-like bill.

Present distribution: Confined to island of Maui where only known to occur in native rain forest on the northeast slope of Haleakala volcano between 4,000 and 6,000 feet. Seen in 1950 (Greenway 1958), and 1967 (Banko 1968) in Kipahulu Valley.

Former distribution: Only known from above area.

Status: Very rare and limited in distribution.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Change of natural environment by man through clearing and introduction of domestic livestock. Possibly result of disease carried into its habitat by introduced birds and transmitted by introduced insects.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign species. Acquisition and protection of large section of Kipahulu Valley, Maui, by The Nature Conservancy for inclusion as a wilderness area.

Measures proposed: Preservation of additional natural environment including establishment of needed refuges. Prevent introduction of harmful insects, plants, and animals. Initiate ecological and life history research of the species. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate propagation program or develop techniques which may be applied to Hawaiian forest birds. Control of feral grazing animals and domestic stock.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

Banko, W. E. 1968. Condor 70: 265-266.
Bureau of Sport Fisheries and Wildlife Administrative Reports.
Greenway, J. C. 1958. Extinct and vanishing birds of the world.
Hawaii Division of Fish and Game Administrative Reports.
Munro, G. C. 1960. Birds of Hawaii.
Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. Condor 70: 101-120.

OU — Psittirostra psittacea (Gmelin)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Small bird with short, parrot-like bill, yellow head, and olive green back, wings, and tail. Underparts greenish-gray. Female has green head and duller plumage.

Present distribution: Islands of Kauai (Alakai Swamp) and Hawaii in Hawaii. One seen near Hawaii Volcanoes National Park headquarters, Hawaii, July 19, 1970.

Former distribution: Islands of Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii.

Status: Very rare in restricted, vulnerable habitat. Less rare on Kauai. Irrigation and power dam and reservoir proposed on edge of Alakai Swamp.

Estimated numbers: Unknown.

Breeding rate in the wild: Unknown.

Reasons for decline: Possibly introduced avian diseases and parasites. Possibly alteration of habitat by invasion of foreign plants or browsing by feral pigs, goats and domestic livestock.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign species of birds. Establishment of the 10,000-acre Alakai Swamp Wilderness Preserve by Hawaii State regulation which prohibits disturbance of the major habitat on Kauai. Field investigations in progress.

Measures proposed: Preservation of natural environment including establishment of needed refuges and prevent introduction of harmful insects, plants, and animals. Control of feral grazing animals and domestic stock. Initiate ecological and life history research. Initiate propagation program and develop techniques which may be applied to Hawaiian Forest birds. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.

Greenway, J. C., Jr. 1958. Extinct and vanishing birds of the world.

Hawaii Division of Fish and Game Administrative Reports.

Munro, G. C. 1960. Birds of Hawaii.

Richardson and Bowles. 1961. Record of the rarer native forest birds of Kauai, Hawaii, Condor 63:179-180.

Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. Condor 70:101-120.

LAYSAN FINCH — Psittirostra c. cantans (Wilson)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Finch-like Hawaiian honeycreeper with thick bill. Male, yellow head and breast. Brownish back, wings, and tail. Female, duller with streakings on crown, back and flanks. Immatures streaked above and below. Differs from other race of the species on Nihoa Island by larger size and paler coloration.

Present distribution: Endemic to Laysan Island, Hawaiian Islands National Wildlife Refuge. About 400 (1972) presently on Southeast Island, Pearl and Hermes Reef, Hawaiian Islands National Wildlife Refuge from 100 introduced March 21, 1967. About 8 to 10 each on Grass and Seal Islands at Pearl and Hermes Reef also.

Former distribution: Laysan Island.

Status: Although common within its limited range, confinement of entire population to two small islands makes it vulnerable to extinction, if pest plants, insects, or predatory animals are accidentally liberated there that could drastically change the habitat or introduce diseases.

Estimated numbers: About 10,000 on Laysan Island (1972) and 400 + on Pearl and Hermes Reef (1972).

Breeding rate in the wild: Clutch size 3 to 4.

Reasons for decline: Almost became extinct in early part of the century because of destruction of vegetation by rabbits introduced by man on Laysan Island.

Protective measures already taken: Introduced rabbits were exterminated on Laysan Island. Frequency of patrol being increased. Continued research in progress. Protected by Federal and State law. Birds transplanted to Southeast Island, Pearl and Hermes Reef have reproduced quite well. Landing on island restricted and by permit only. Status of refuge and need of entry permit information included in nautical charts of area and U.S. Coast Pilot. Status of refuge publicized in news media.

Measures proposed: Intensified patrol by refuge personnel. Trial introductions on other islands, but not on Nihoa, where another race of this species already occurs and which would lose its identity by hybridization. Prevent introduction of harmful insects, plants, and animals. Continue captive propagation program. Increase patrol. Continue research. Continue to publicize critical status and aesthetic and scientific values.

Number in captivity: Two at Honolulu Zoo.

Breeding potential in captivity: Good. Bred successfully at Honolulu Zoo (Throp, 1970), and University of Michigan.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.
Throp, J. L. 1970. The Laysan finchbill in the Honolulu Zoo. Elepaio 31: 31-40.

NIHOA FINCH — Psittirostra cantans ultima (Bryan)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: Hawaiian honeycreeper with thick, finch-like bill. Male has head and breast yellow becoming dull white on abdomen. Upper parts brownish washed with yellow. Female similar, but duller and with brownish flanks. Immatures streaked above and below. Differs from other race of the species on Laysan Island by darker coloration and smaller size.

Present distribution: Endemic to Nihoa Island, Hawaii. About 10 from 36 transplanted in 1967 surviving on Fern Island at French Frigate Shoals as of 1972.

Former distribution: Nihoa Island, Hawaii.

Status: Fairly common where it occurs; geographic range limited to one small island makes it vulnerable to extinction if the habitat is adversely altered or harmful insects or other animals are introduced.

Estimated numbers: About 3,500 based on transect counts in September, 1972 by refuge personnel. Populations fluctuate from year to year for unknown reasons.

Breeding rate in the wild: Two to four eggs.

Reasons for decline: Not known to have declined.

Protective measures already taken: Protected by State and Federal law. Entire range is included in the Hawaiian Islands National Wildlife Refuge. Frequency of patrol by refuge personnel is being increased. Field investigations are being continued. Landing on island restricted and by permit only. Status of refuge and need of permit information included on nautical charts of area and in U.S. Coast Pilot. Status of refuge publicized in news media.

Measures proposed: Increased patrol by refuge personnel and continued publicity to acquaint public, military and seafarers with the status of island. Trial introductions on other islands such as Necker Island, which most closely resembles Nihoa, but not Laysan where another race of this species would lose its identity by interbreeding. Prevent introduction of harmful insects, plants, and animals. Initiate artificial propagation program. Continue ecological and life history research of the species. Continue to publicize critical status and aesthetic and scientific values.

Number in captivity: Four at University of Hawaii.

Breeding potential in captivity: Possible. One young raised by Dr. Andrew Berger at University of Hawaii from nesting attempt by birds in experimental propagation program.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.
Munro, G. C. 1960. Birds of Hawaii.

PALILA — Psittirostra bailleui (Oustalet)

Order: PASSERIFORMES — Family: DREPANIDIDAE

Distinguishing characteristics: A small bird with thick, heavy bill; yellow head, neck, and breast; abdomen white; back gray; wings and tail black.

Present distribution: Island of Hawaii. Presently restricted to the mamane-naio forests on Mauna Kea between 7,000 and 9,500 feet (Berger 1970).

Former distribution: Wider distribution on the island including upper forest zone of Kona and Hamakua districts from 4,000 to 10,000 feet.

Status: Uncommon in its restricted range which is continuing to be reduced.

Estimate numbers: Low hundreds.

Breeding rate in the wild: Two eggs (Berger 1970).

Reasons for decline: Possibly decimated by introduced bird diseases transmitted by introduced insects, encroachment of civilization on habitat, and particularly the reduction of the mamane-naio forests due to overgrazing by feral sheep and goats.

Protective measures already taken: Protected by State law. Selective limitation by State and Federal Governments of introduction of foreign species. Some reduction of feral animals by public hunting. Field investigations in progress.

Measures proposed: Preservation of natural environment, including establishment of needed refuges. Prevent introduction of harmful insects, plants, and animals. Control of feral grazing animals. Continue ecological and life history research. Publicize critical status and aesthetic and scientific values. Quarantine on all birds, including cage birds brought into the State to prevent introduction of disease. Initiate artificial propagation program or develop techniques applicable to Hawaiian forest birds.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Berger, A. J. 1970. The present status of the birds of Hawaii, Elepaio 31(6): 51-60.

_____ 1970. The eggs and young of the palila, an endangered species, Condor 72: 238-240.

Bureau of Sport Fisheries and Wildlife Administrative Reports.

Greenway, J. C., Jr. 1958. Extinct and vanishing birds of the world.

Hawaii Division of Fish and Game Administrative Reports

Munro, G. C. 1960. Birds of Hawaii.

Warner, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. Condor 70: 101-120.

WALLOWA GRAY-CROWNED ROSY FINCH — Leucosticte tephrocotis wallowa (Miller)

Order: PASSERIFORMES — Family: FRINGILLIDAE

Distinguishing characteristics: Small brown sparrow-like bird with rosy wings and rump and gray head patch. Distinguished from neighboring subspecies of gray-crowned rosy finches of the Cascades and Blue Mountains by having cinnamon brown of lower surface duller and more sooty, and darker, less tawny upper parts, with dark streaks of back darker and broader. Much browner and less blackish than the black rosy finch (L. atrata) of the nearby Seven Devils Mountains to the east.

Present distribution: Confined in breeding season to open, alpine habitats in the Wallowa Mountains, Oregon. Presumably winters at lower elevations but exact area unknown.

Former distribution: Same as present.

Status: Vulnerable because it is uncommon within its breeding range which is confined to a very limited area of alpine habitats in one isolated mountain range. Habitat requirements are rocky terrain with permanent snow fields, cliffs, and small meadows. Compared with other rosy finches, it does not seem to be as abundant as it should be in seemingly suitable habitat.

Estimated numbers: No estimate.

Breeding rate in the wild: Probably 3 to 5 eggs like other subspecies of gray-crowned rosy finch.

Reasons for decline: Not known to be declining.

Protective measures already taken: Protected by Federal and State laws. Entire breeding range falls within that part of the Wallowa-Whitman National Forest which is protected under the Wilderness Act as the Eagle Cap Wilderness Area. Information on this bird provided by the U.S. Forest Service to wilderness area users on Eagle Cap Wilderness Area map.

Measures proposed: Preserve the natural environment. Surveillance of the area by periodic observations to learn more about this subspecies' life history, status and distribution.

Number in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Bent, A. C. 1968. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies, Part 1. (Compiled and edited by Oliver L. Austin, Jr.). Smithsonian Inst. Press. Wash., D. C. 602 pp.

Johnson, R. E. (in lit.)

Marshall, D. B. Administrative reports, Bureau of Sport Fisheries and Wildlife.

Miller, A. H. 1939. The breeding leucostictes of the Wallowa Mountains, Oregon. Condor 41: 34-35.

IPSWICH SPARROW — Passerculus princeps (Maynard)

Order: PASSERIFORMES — Family: FRINGILLIDAE

Distinguishing characteristics: A streaked, sandy-colored sparrow living in the sand dunes.

Present distribution: Breeds on Sable Island off Nova Scotia. Winters among sand dunes along Atlantic coast from Sable Island south to southern Georgia.

Former distribution: Same as present.

Status: Vulnerable because oil exploitation in its limited habitat on a small breeding island. Limited to narrow belt of Atlantic coast sand dunes, particularily the outer dunes, for winter habitat. Reported in recent years to be less common on wintering grounds than formerly. The bulk of the population probably winters from New Jersey to Virginia (Stobo and McLaren 1971).

Estimated numbers: McLaren estimated a breeding population on Sable Island of 4,000 birds nesting in 280 hectares of habitat in 1967.

Breeding rate in the wild: 4 or 5 eggs per set.

Reasons for decline: Reduction in size of breeding area by progressive washing away of already very small Sable Island (Dwight, 1895 and Erskine, 1964). Interference with winter habitat by residential development along the Atlantic coast beaches.

Protective measures already taken: Establishment of Chincoteague, Back Bay, Pea Island, Cape Romain, Blackbeard Island, Wolf Island, and Tybee National Wildlife Refuges, and of Cape Cod, Asateague Island, and Cape Hatteras National Seashores will assure continuation of Ipswich sparrow sand dune wintering habitat in these places.

Measures proposed: Setting aside of additional national seashore areas and national wildlife refuges along the Atlantic coast and encouraging preservation of sand dunes in natural condition on properties under private ownership. Establishing a refuge for this species on Sable Island by Canadian Government.

Number in captivity: None known.

Breeding potential in captivity: Good.

References:

Dwight, J., Jr. 1895. The Ispwich sparrow (Ammodramus princeps Maynard) and its summer home. Memoirs of the Nuttall Ornithological Club. No. 11. 56 pp.

McLaren, I. A. 1968. Censuses of Ipswich sparrow on Sable Island Can. Field Nat. 82:148-150.

_____. 1969. Ipswich sparrow and its island home, Canadian Audubon, Nov.-Dec. 1969:134-140.

Stobo, W. T. and I. A. McLaren. 1971 Late winter distribution of the Ipswich sparrow. Amer. Birds. 25:941-944.

DUSKY SEASIDE SPARROW — Ammospiza nigrescens (Ridgway)

Order: PASSERIFORMES — Family: FRINGILLIDAE

Distinguishing characteristics: A dark colored sparrow-size bird of the coastal salt marshes. Upper parts blackish, under parts heavily streaked with black, yellow line between eye and bill, and white streak along jaw.

Present distribution: Resident in salt marshes on Merritt Island, Florida, from Marsh Bay south to Brock Creek, and on the mainland in the brackish marshes on the east side of the upper St. Johns River west of Titusville south to Sharpe.

Former distribution: Much more widespread on Merritt Island and possibly along the St. Johns River.

Status: Jeopardized because of very restricted salt marsh habitat which is being continually reduced.

Estimated numbers: Estimate in 1969, between 1,000 and 2,000 individuals. Most of these are on the St. Johns River marshes with only about 80 on Merritt Island.

Breeding rate in the wild: Usually 4 eggs per set. The species is double and, perhaps sometimes, triple-brooded.

Reasons for decline: Altering of habitat on Merritt Island by construction of impoundments to insure flooding for mosquito control and on the St. Johns because of the proposed changes of the Army Corps of Engineers, Central and Southern Florida Flood Control District, and real estate development.

Protective measures already taken: Part of the population is within the Merritt Island National Wildlife Refuge. Studies have been made by Charles H. Trost, 1961-1963, and Brian Sharp, 1968, which have determined the habitat requirements and remedial measures necessary for correction of deteriorating habitat. Study of effects of experimental marsh management on the Merritt Island National Wildlife Refuge are in progress.

Measures proposed: Flood its former habitat on Merritt Island with salt water again to restore the former vegetation and eliminate the brackish species that have intruded, bringing new predators with them. Continue research on the status, distribution, life history, and ecology of the species. The State of Florida pass legislation fully protecting the bird. Establish a refuge or sanctuary for the species on the St. Johns River.

Breeding potential in captivity: Unknown.

References:

Sharp, B. 1968. Numbers, distribution, and management of the dusky seaside sparrow. Thesis for Masters Degree, Department of Wildlife Ecology, University of Wisconsin, Madison, Wisconsin.

_____. 1969. Conservation of the dusky seaside sparrow on Merritt Island, Florida. Biological Conservation 1(2):175-176.

_____. 1969. Let's save the dusky seaside sparrow. Florida Naturalist 42(2):68-70.

_____. 1970. A population estimate of the dusky seaside sparrow. Wilson Bulletin 82(2):158-166.

Sykes, P. W., Jr. Administrative reports, Bureau of Sport Fisheries and Wildlife.

Trost, C. H. 1968. Dusky seaside sparrow. In A. C. Bent et al. (O. L. Austin, ed.), Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. U.S. Nat. Mus. Bull. 237:849-859.

CAPE SABLE SPARROW — Ammospiza mirabilis (Howell)

Order: PASSERIFORMES — Family: FRINGILLIDAE

Distinguishing characteristics: Dull colored, olive-gray sparrow, smaller than house sparrow, with a short yellow line before the eyes, and white streak along the jaw. Greener above and whiter below than the more common seaside sparrows.

Present distribution: Resident in a few scattered populations in fresh and brackish water marshes of southwestern Florida from Ochopee south to Cape Sable.

Former distribution: Same as present.

Status: Very uncommon with constantly changing population in a restricted range. Habitat is brackish marsh of salt marsh cordgrass (Spartina bakeri) between mangrove belt and fresh water Everglades sawgrass.

Estimated numbers: Less than 1,000. Perhaps less than 500. Werner (1970) located a minimum of 27 individuals in the Ochopee-Turner River area and 11 at Cape Sable.

Breeding rate in the wild: Three or four eggs laid per set, number of broods unknown. Adult to juvenile ratios; 6 to 5 at Cape Sable; 13 to 2 at Ochopee (Werner 1970).

Reasons for decline: Limited habitat which is very unstable as a result of fire, draught, hurricanes, and encroachment of mangroves on marsh grass. Real estate development now encroaching on range outside Everglades National Park at Ochopee.

Protective measures already taken: Protection is afforded by the Everglades National Park. Complete protection by Florida and Federal law. Study of present distribution and limiting factors was begun in 1970 by Harold W. Werner, graduate student at University of South Florida.

Measures proposed: Continue research on the distribution and ecology of the species. Acquire habitat outside of park. Manage habitat to create conditions found by study to be optimum for species.

Number in captivity: None

Breeding potential in captivity: Good.

References:

Robertson, W. B. Everglades National Park, P. O. Box 299, Homestead, Florida.

Stimpson, L. A. 1956. Auk, 73:489-502. Also in Bent's life histories of North American birds.

Sykes, P. Administrative reports, Bureau of Sport Fisheries and Wildlife.

Werner, H. W. 1970. (in lit.)

_____. 1971. Cape Sable sparrows rediscovered on Cape Sable. Auk 88:432.

PERIPHERAL BIRDS

A peripheral species or subspecies is one whose occurrence in the United States is at the edge of its natural range and which is threatened with extinction within the United States although not in its range as a whole. Special attention is necessary to assure retention in our Nation's fauna.

Harcourt's Petrel, Oceanodroma castro
Breeds in the Pacific on Hawaiian Islands (Kauai and possibly other high islands), the Galapagos Islands and possibly Cocos Island; in the Atlantic from the Azores to Ascension Island and St. Helena. Endangered in Hawaii.

Green-throated Arctic Loon, Gavia arctica viridigularis
Breeds from Cape Prince of Wales, Alaska, west to Khatanga River, Kamchatka and Sakhalin Island, U.S.S.R. Winters south to Baltic Sea and Japan.

Northeastern Least Grebe, Podiceps dominicus brachypterus
Resident from southern Texas south to Panama.

Red-Billed Tropicbird, Phaethon aethereus mesonauta
Breeds off both coasts of Middle America, northern South America and the Caribbean Islands. Rarely in Puerto Rico.

Atlantic Blue-Faced Booby, Sula dactylatra dactylatra
Bahamas and West Indies including Puerto Rico and the Virgin Islands, to northeastern coast of South America, Fernando de Noronha and South Trinidad.

Red-Faced Cormorant, Phalacrocorax urile
Breeds from Pribilof Islands and Aleutian Islands west to Komandorskie Islands and Siberia, U.S.S.R. Winters from Pribilof and Aleutian Islands south to Japan.

Eastern Reddish Egret, Dichromanassa r. rufescens
Breeds along Texas coast and in Florida Keys south to Hispaniola. Winters from southern Texas south to Venezuela.

Roseate Spoonbill, Ajaia ajaja
Breeds and winters from coastal Texas, Louisiana, and southern Florida south to central Argentina.

West Indian Tree Duck, Dendracygna arborea
Resident in West Indies. Rare in Puerto Rico and Virgin Islands.

White-Cheeked Pintail (Bahama duck), Anas bahamensis
Resident in the West Indies. Rare in Puerto Rico and Virgin Islands.

Northern Black-Bellied Tree Duck, Dendrocygna autumnalis fulgens
Breeds from southeastern Arizona and Gulf coast of Texas south to Panama. Winters from Mexico south to Panama.

Masked Duck, Oxyura dominica
Resident in Mexico south to Argentina, casual in South Texas; rare in Puerto Rico.

Short-Tailed Hawk, Buteo brachyurus
Breeds from northern Florida and eastern Mexico south to northern Argentina. Rare in Florida.

Zone-Tailed Hawk, Buteo albonotatus
Resident from northern Baja California, central Arizona, southwestern New Mexico, and centralwestern Texas, southward to northern South America.

Sennett's White-Tailed Hawk, Buteo albicaudatus hypospodius
Resident in southern Arizona and Southern Texas south to North Colombia and Western Venezuela.

Northern Gray Hawk, Buteo nitidus maximus
Breeds from Southern Arizona, Southern New Mexico, and Southern Texas south to northern Mexico. Winters in Mexico.

Northern Black Hawk, Buteogallus a. anthracinus
Resident from Southern Arizona, Southern New Mexico, and Southern Texas south to northern Colombia.

Northern Chachalaca, Ortalis vetula mccalli
Resident from lower Rio Grande region of Texas south to Northern Vera Cruz.

Richardson's Blue Grouse, Dendragapus obscurus richardsonii
Resident from extreme northern Idaho and northwest Montana to Yukon Territory.

Northern White-Tailed Ptarmigan, Lagopus l. leucurus
Resident from northern Yukon to northwestern Montana.

Gould's Turkey, Meleagris gallopavo mexicana
Resident in mountains from southwestern New Mexico south to northern Jalisco, Mexico.

Northern Jacana, Jacana s. spinosa
Resident from southern Texas south to Panama.

Rufous-Necked Sandpiper, Erolia ruficollis
Breeds in vicinity of Wales, western Alaska to northeast Siberia, U.S.S.R. Winters from southern China to islands of southeast Pacific, Australia, and New Zealand.

Elegant Tern, Thalasseus elegans
Formerly bred along the Pacific Coast of Baja California but now apparently confined to islands in the Gulf of California, Mexico and a small nesting colony in San Diego Bay California.

Northern Xantus' Murrelet, Endomychura hypoleuca scrippsi
Breeds from southern California to central Baja California. Winters on coast of southern California and Baja California.

Whiskered Auklet, Aethia pygmaea
Breeds on western Aleutian Islands west to Komandorskie Islands and southern Kurile Islands. Winters on waters surrounding breeding range.

Northern Red-Billed Pigeon, Columba f. flavirostris
Resident from lower Rio Grande Valley in Texas south to Nicaragua.

Northern White-Fronted Dove, Leptotila verreauxi angelica
Resident in lower Rio Grande Valley of Texas south to northern Vera Cruz and Chiapas.

Florida Mangrove Cuckoo, Coccyzus minor maynardi
Breeds from southeast coast of Florida to Bahama Islands and Cuba. Winters in breeding range south of Florida.

Northern Groove-Billed Ani, Crotophaga s. sulcirostris
Resident from lower Rio Grande Valley in Texas to Colombia and British Guiana.

Ferruginous Owl, Glaucidium brasilianum
Resident from southern Arizona and lower Rio Grande Valley, Texas, southward in lowlands to southern South America.

West Indian Nighthawk, Chordeiles minor gundlachii
Breeds in Florida Keys, Bahamas, Hispaniola, and rarely Puerto Rico. Winters presumably in South America.

Eastern Blue-Throated Hummingbird, Lampornis c. clemenciae
Breeds in mountains of central western Texas south to southern Mexico. Winters in lowlands of Mexico.

Western Blue-Throated Hummingbird, Lampornis clemenciae bessophilus
Breeds in mountains of southeastern Arizona and southwestern New Mexico south to central western Mexico. Winters at lower elevations.

Northern Buff-Bellied Hummingbird, Amazilia yucatanensis chalconota
Breeds from lower Rio Grande Valley in Texas south to San Luis Potosi and Vera Cruz, Mexico. Winters in southern Tamaulipas and Vera Cruz, Mexico.

Northern Violet-Crowned Hummingbird, Amazilia verticalis ellioti
Breeds from southern Arizona south to Colima and Hidalgo, Mexico. Winters in Mexico.

Coppery-Tailed Elegant Trogon, Trogon elegans canescens
Breeds from central southern Arizona south to Sinaloa. Winters in northwestern Mexcico.

Northeastern Elegant Trogon, Trogon elegans ambiguus
Resident in lower Rio Grande Valley of Texas south to Isthmus of Tehuantepec, Mexico.

Northeastern Green Kingfisher, Chloroceryle americana septentrionalis
Resident from southern Texas south to Guatemala and El Salvador.

Northwestern Green Kingfisher, Chloroceryle americana hachisukai
Resident from centralwestern Texas south to Nayarit, Mexico.

Northwestern Rose-Throated Becard, Platypsaris aglaiae richmondi
Breeds from southern Arizona south to southern Sonora, Mexico. Winters in Mexico.

Northeastern Rose-Throated Becard, Platypsaris aglaiae gravis
Resident from lower Rio Grande Valley, Texas, south to San Luis Potosi and northern Vera Cruz, Mexico.

Northeastern Tropical Kingbird, Tyrannus melancholicus couchii
Resident from extreme southern Texas south to Puebla and central Vera Cruz, Mexico.

Northwestern Tropical Kingbird, Tyrannus melancholicus occidentalis
Breeds from southeastern Arizona south to Guerrero, Mexico. Winters in Guatemala.

Northern Thick-Billed Kingbird, Tyrannus crassirostris pompalis
Resident in South Arizona and North Sonora.

Northern Buff-Breasted Flycatcher, Empidonax fulvifrons pygmaeus
Breeds from southeastern Arizona south to southwestern Chihuahua. Winters in Mexico.

Northeastern Beardless Flycatcher, Camptostoma i. imberbe
Breeds from extreme southern Texas south to Costa Rica. Winters in Mexico and Costa Rica.

Northwestern Cave Swallow, Petrochelidon fulva pallida
Breeds from southeast New Mexico and south central Texas, in the vicinity of certain caves, south to Coahuila and Tamaulipas, Mexico. Winter range unknown.

Couch's Mexican Jay, Aphelocoma ultramarina couchii
Resident in mountains of Big Bend of Texas south to central Nuevo Leon and Tamaulipas, Mexico.

Northern Green Jay, Cyanocorax yncas luxuosus
Resident from lower Rio Grande Valley, Texas, south to Guanajuato and central Vera Cruz, Mexico.

Cascade Boreal Chickadee, Parus hudsonicus cascadensis
Resident from central southern British Columbia south to central northern Washington.

Azure Eastern Bluebird, Sialia sialis fulva
Resident from central southern Arizona south to southern Mexico.

Red-Spotted Bluethroat, Luscinia s. svecica
Breeds from coast of northern Alaska west to northern Asia and Europe. Winters from northern Africa to northwestern India.

Cuban Black-Whiskered Vireo, Vireo altiloquus barbatulus
Breeds along coast of southern Florida to Bahamas, Cuba, and Isle of Pines. Winters in Amazon Basin, South America.

Colima Warbler, Vermivora crissalis
Breeds from southwestern Texas to southwestern Tamaulipas, Mexico. Winters from southern Sinaloa south to Guerrero, Mexico.

Olive Warbler, Peucedramus taeniatus arizonae
Breeds from central and southeastern Arizona and southwestern New Mexico south to central Mexico.

Cuban Yellow Warbler, Dendroica petechia gundlachi
Resident in lower Florida Keys, Cuba, and Bahamas.

Northern Olive-Backed Warbler, Parula pitiayumi nigrilora
Resident from lower Rio Grande Valley, Texas, south to northern Hidalgo and northern Vera Cruz, Mexico.

Alta Mira Lichtenstein's Oriole, Icterus gularis tamaulipensis
Resident from extreme southern Texas south to Campeche, Mexico.

Audubon's Black-Headed Oriole, Icterus graduacauda audubonii
Breeds from southern Texas south to central Tamaulipas, Mexico. Winters in breeding range and southward to San Luis Potosi, Mexico.

Dickey's Varied Bunting, Passerina versicolor dickeyae
Breeds from central southern Arizona to Colima. Winters in northwestern Mexico.

Northern White-Collared Seedeater, Sporophila torqueola sharpei
Resident from extreme southern Texas south to San Luis Potosi and northern Vera Cruz, Mexico.

Southeastern Pine Grosbeak, Pinicola enucleator eschatosus
Breeds from northern New England north to central Quebec and Newfoundland. Winters in breeding range and occasionally south to Virginia.

Northern Olive Sparrow, Arremonops r. rufivirgata
Resident from southern Texas south to eastern Coahuila and central Tamaulipas.

Arizona Grasshopper Sparrow, Ammodramus savannarum ammolegus
Breeds in southeastern Arizona and northern Sonora.

Northern Rufous-Winged Sparrow, Aimophila c. carpalis
Resident from southern Arizona south to central Sonora.

Northeastern Botteri's Sparrow, Aimophila botterii texana
Resident from lower Rio Grande Valley, Texas, south to northeastern Tamaulipas, Mexico.

Western Botteri's Sparrow, Aimophila b. botterii
Breeds from southeastern Arizona south to southern Mexico. Winters in southern part of breeding range.

STATUS-UNDETERMINED BIRDS

A status-undetermined species or subspecies is one that has been suggested as possibly threatened with extinction, but about which there is not enough information to determine its status. More information is needed.

Wood, Ibis, Mycteria americana
Resident from Florida and Gulf Coast south on both coasts of Mexico and central America to southern South America.

White-Faced Ibis, Plegadis chihi
Breeds from eastern Oregon, southern Idaho, northern Utah, Colorado, and Nebraska south locally to southern South America.

Red-Bellied Red-Shouldered Hawk, Butei lineatus elegans
Resident in Sacramento and San Joaquin Valleys and southern coastal lowlands of California south to northern Baja California.

Puerto Rican Broad-Winged Hawk, Buteo platypterus brunnescens
Resident locally in small numbers in Puerto Rico chiefly in El Yunque but also at Utuado and Maricao.

Ferruginous Hawk, Buteo regalis
Breeds from eastern Washington and southwestern Manitoba south to Nevada and western Oklahoma. Winters chiefly from southwestern United States south to northern Mexico.

American Osprey, Pandion haliaetus carolinensis
Breeds from northern Alaska south to Baja California and Sonora, east to southern Labrador, Newfoundland, and southern Florida. Winters from southern United States south to South America.

Audubon's Caracara, Caracara cheriway audubonii
Resident from southern Arizona, southern Texas, and central Florida south to western Panama and Cuba.

Northern Aplomado Falcon, Falco fermoalis septentrionalis
Bred formerly from southern Arizona, southwestern New Mexico, and southern Texas south to southern Mexico.

Prairie Pigeon Hawk, Falco columbarius richardsonii
Breeds from southern Alberta, southern Saskatchewan, and southwestern Manitoba south to northern Montana and northern North Dakota. Winters from Wyoming and California south to northern Mexico.

Eastern Pigeon Hawk, Falco c. columbarius
Breeds from northern Manitoba east to Labrador and Newfoundland south to northeastern North Dakota, northern Minnesota, northern Michigan, northern New York, Maine, and Nova Scotia. Winters from southern Texas east to South Carolina and south to the West Indies and northern South America.

Townsends's Rock Ptarmigan, Lagopus mutus townsendi
Resident on Kiska and Little Kiska, and possibly Buldir Islands, Aleutian Islands.

Yunaska Rock Ptarmigan, Lagopus mutus yunaskensis
Resident on Yunaska Island, possibly also Amukta Island and Island of the Four Mountains, Aleutian Islands.

Sanford's Rock Ptarmigan, Lagopus mutus sanfordi
Resident on Tanaga and Kanaga Islands, Aleutian Islands.

Dixon's Rock Ptarmigan, Lagopus mutus dixoni
Resident in southern Alaska from Yakutat Bay south to Baranof and Admiralty Islands.

Columbian Sharp-Tailed Grouse, Pedioecetes phasianellus columbianus
Resident from northcentral British Columbia south to northwestern Nevada east to western Colorado and northern New Mexico.

Texas Gambel's Quali, Lophortyx gambelii ignoscens
Resident in Rio Grande Valley in western Texas.

Western Snowy Plover, Charadrius alexandrinus nivosus
Breeds on Pacific coast from southern Washington south to southern Baja California east to southwestern Kansas; northwestern Oklahoma, north central and southern Texas. Winters on Pacific coast from northern Oregon to southern Baja California and the Gulf coast from southern Texas east to Mississippi.

Mountain Plover, Eupoda montana
Breeds in Great Plains from Montana and North Dakota to southeastern New Mexico and western Texas. Winters from central California, southern Arizona, and central and coastal Texas south to southern Baja California.

Northern Long-Billed Curlew, Numenius americanus parvus
Breeds from south central British Columbia, southern Alberta, southern Saskatchewan, and southern Manitoba south to north eastern California, central western Nevada, northern Idaho, southwestern Montana, central Wyoming and northwestern South Dakota. Winters from central California, southern Texas and southern Louisiana south to middle Mexico.

Bristle-Thighed Curlew, Numenius tahitiensis
Breeds locally in mountains of southwestern Alaska. Winters in islands of central and southwestern Pacific.

Alaskan Short-Billed Dowitcher, Limnodromus griseus caurinus
Breeds along southcentral Alaskan coast from Nushagak Bay to Yakutat Bay. Winters south along the Pacific coast to Baja California.

Pacific Bar-Tailed Godwit, Limosa lapponica baueri
Breeds from Kuskokwim delta to Colville delta, western Alaska. Winters in southwestern Asia and Malaysia to Australia and New Zealand.

Red-Legged Kittiwake, Rissa brevirostris
Breeds on Komandorskie and Pribilof Islands, Bering Sea. Winters on adjoining seas.

Newton's Puerto Rican Screech Owl, Otus nudipes newtoni
Resident on St. Thomas, St. John, and St. Croix, Virgin Islands.

Florida Burrowing Owl, Speotyto cunicularia floridana
Resident prairie central and southern Florida.

Western Burrowing Owl, Speotyto cunicularia hypugaea
Breeds from southern interior British Columbia east to central southern Manitoba and eastern border of Great Plains, south to central Mexico. Winters over much of breeding range except in northern Great Basin and Great Plains region.

Puerto Rican Short-Eared Owl, Asio flammeus portoricensis
Puerto Rico where apparently widely distributed but localized in the area of the Anegardo Lagoon, some swamps in the west of the island, Guanica Forest, and Rio Piedras.

Pribilof Winter Wren, Troglodytes t. alascensis
Resident in Pribilof Islands, Alaska.

Semidi Winter Wren, Troglodytes t. semidiensis
Resident on Semidi Islands, southeastern Alaska.

Unalaska Winter Wren, Troglodytes t. petrophilus
Resident on Unalaska and other islands in Fox Islands, Alaska.

Kiska Winter Wren, Troglogytes t. kiskensis
Resident on Kiska, Little Kiska, Amchitka, Ogliuga, and Semisoposhnoi Islands in the central Aleutian Islands.

Tanaga Winter Wren, Troglogytes t. tanagensis
Resident in Andreanof Islands in the central Aleutian Islands.

Seguam Winter Wren, Troglodytes t. seguamensis
Resident on Seguam, Amukta, Yunaska, Islands of the Four Mountains, Aleutian Islands.

Black-Capped Vireo, Vireo atricapilla
Breeds locally from northcentral Oklahoma through central Texas to central northern Mexico. Winters on the west coast of Mexico from southern Sonora to Guerrero.

Pribilof Gray-Crowned Rosy Finch, Leucosticte tephrocotis umbrina
Resident on St. Paul, St. George, St. Matthew, and Otter Islands, Bering Sea.

Florida Grasshopper Sparrow, Ammodramus savannarum floridanus
Resident central peninsula Florida.

Yakutat Fox Sparrow, Passerella iliaca annectens
Breeds in coastal Alaska, in the vicinity of Yakutat Bay. Winters from southwestern British Columbia south to southern California.

Samuel's Song Sparrow, Melospiza melodia samuelis
Resident in salt marshes on northern side of San Francisco and San Pablo Bays central-western California.

San Francisco Song Sparrow, Melospiza melodia pusillula
Resident in salt marshes surrounding south area of San Francisco Bay, California.

Suisun Song Sparrow, Melospiza melodia maxillaris
Resident in brackish marshes surrounding Suisun Bay, central California.

Amak Song Sparrow, Melospiza melodia amaka
Resident on Amak Island, Aleutian Islands.

McKay's Bunting, Plectrophenax hyperboreus
Breeds on Hall and St. Matthew Islands, Bering Sea. Winters there and in western coastal Alaska.

Threatened

MAMMALS

of the United States

Species or subspecies of mammals that are so few in numbers or so threatened by present circumstances, as to be in danger of extinction.

Arranged, one sheet for each species or subspecies (whales are grouped on one sheet), in systematic order.

Note--On the mammal data sheets some of the general references are in shortened form; they are listed in fuller form immediately following this sheet.

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Beard, Daniel B. 1942. Fading Trails; The Story of Endangered American Wildlife. Macmillan, New York. 279 p.

Crandall, Lee S. 1964. The Management of Wild Mammals in Captivity. University of Chicago Press. 761 p.

Elliot, Daniel Giraud. 1904. The Land and Sea Mammals of Middle America and the West Indies. Publications of the Field Columbian Museum, Zoological Series, Vol. 4, Part 2.

Hall, E. Raymond, and Keith R. Kelson. 1959. The Mammals of North America. Ronald Press, New York. 2 Vols. 1083 p.

Kenyon, Karl W., and Victor B. Scheffer. 1955. The seals, Sea-Lions, and Sea Otter of the Pacific Coast; Descriptions, Life History Notes, Photographs, and Drawings. U.S. Fish and Wildlife Service, Circular 32. 34 p.

Matthiessen, Peter. 1959. Wildlife in America. Viking, New York. 304 p.

National Wildlife Federation. 1956. Our Endangered Wildlife. 32 p.

Palmer, Ralph S. 1954. The Mammal Guide; Mammals of North America North of Mexico. Doubleday, Garden City, New York. 384 p.

Scheffer, Victor B. 1958. Seals, Sea Lions, and Walruses. Stanford University Press. 179 p.

INDIANA BAT — Myotis sodalis (Miller and Allen)

Order: CHIROPTERA — Family: VESPERTILIONIDAE

Distinguishing characteristics: A medium-size myotis, closely resembling the little brown bat (Myotis lucifugus) but differing in coloration, the fur being a dull grayish chestnut rather than bronze, with the basal portion of the hairs of the back dull lead colored; coloration of underparts pinkish to cinnamon; hind feet smaller and more delicate than in M. lucifugus; calcar strongly keeled.

Present distribution: Midwest and Eastern United States from the western edge of Ozark region in Oklahoma to central Vermont, to southern Wisconsin, and as far south as northern Florida. Distribution is associated with major cavernous limestone areas and areas just north of cave regions. (Hall, 1962: 7)

Former distribution: Probably about the same, although there is evidence that many caves within the range of the species have been abandoned since 1950.

Status: Decreasing in numbers.

Estimated numbers: About 500,000.

Breeding rate in the wild: Usually a single young per season in late June.

Reasons for decline: Commercialization of caves in which Indiana bats roost. Wanton destruction of large numbers of Indiana bats by vandals (John S. Hall reported in personal communication, 1965, that a few years ago two boys killed about 10,000 Myotis sodalis in Carter Cave, Kentucky, in just a few minutes). Roosts being disturbed by increasing numbers of spelunkers and others seeking recreation. Disturbances during bat banding programs. Colonies frequently raided for laboratory experimental animals. Insecticide poisoning may possibly be new threat. The species has a fairly restricted geographic range and shows a high degree of aggregation in the winter, when over 90 percent of the estimated population occurs in only four caves. This high degree of aggregation makes the species very vulnerable.

Protective measures already taken: American Society of Mammalogists appointed a committee in the fall of 1963 to investigate the problem of reduction in bat populations; resolution approved by American Society of Mammalogists on June 17, 1964, that removal of bats from caves be discouraged except for scientific research and that molestation of bats in roosts or other unnecessary disturbance be discontinued. Construction of a gate across entrance to Carter Cave, Kentucky, where over 100,000 Myotis sodalis winter, to keep irresponsible persons from entering and destroying bats. Comprehensive study of the life history and taxonomy of the species published in 1962 by John S. Hall. Wyandotte Cave, a winter hibernating area, purchased by Indiana Department of Natural Resources.

Measures proposed: Educate the public with regard to the interesting life history and biology of bats. Publicize the economically important role of bats in insect control. Acquisition and closing to public of caves in which colonies occur.

Numbers in captivity: None known.

Breeding potential in captivity: Unknown; probably no potential.

References:

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Hall, John S. 1962. A life history and taxonomic study of the Indiana bats, Myotis sodalis. Reading Public Museum and Art Gallery, Sci. Publs. No. 12, 68 pp.

Jennings, W. L., and J. W. Layne. 1957. Myotis sodalis in Florida. Jour. Mamm., 38(2):259.

Mumford, R. E., and J. B. Cope. 1958. Summer records of Myotis sodalis in Indiana. Jour. Mamm., 39(4):586-587.

OZARK BIG-EARED BAT — Plecotus townsendii ingens (Handley)

Order: CHIROPTERA — Family: VESPERTILIONIDAE

Distinguishing characteristics: A bat with enormous (1-1/2 inch) ears and lumps on the snout. Closely resembles the more common eastern big-eared bat (Plecotus rafinesquii), but with reddish fur rather than gray, and tan beneath rather than white; eastern species. This race is larger and more reddish than any other race of townsendii.

Present distribution: Known only from straggling individuals found in a dozen caves in northwestern Arkansas and neighboring Oklahoma and Missouri.

Former distribution: Probably the same.

Status: Numbers apparently stable.

Estimated numbers: Less than 100.

Breeding rate in the wild: One young per year.

Reasons for decline: Probably always occurred in small numbers. A relict population. The species is intolerant of human disturbance; disturbance causes the bats to abandon favored roosts.

Protective measures already taken: None.

Measures proposed: Secure protection for the crevice cave in Devils Den State Park, Arkansas, in which most known specimens have been found.

Number in captivity: None.

Breeding potential in captivity: Poor.

Remarks: This race is known only from occasional specimens found in caves, never more than four at a time. All records probably represent stragglers. Surely there must be a nursery colony somewhere in an Ozark cave. So long as it remains unknown to man, this race will probably persist.

References:

Barbour, R. W., and W. H. Davis. 1969. Bats of America. Univ. Press of Kentucky, Lexington.

Handley, Charles O., Jr. 1959. A revision of American bats of the genera Euderma and Plecotus. Proc. U.S. Natl. Mus. 110: 95-246.

Sealander, John A., Jr. 1956. A provisional check-list and key to the mammals of Arkansas (with annotations). Amer. Midl. Nat. 56(2): 257-296.

VIRGINIA BIG-EARED BAT — Plecotus townsendii virginianus (Handley)

Order: CHIROPTERA — Family: VESPERTILIONIDAE

Distinguishing characteristics: A bat with enormous (1-1/2 inch) ears and lumps on the snout. Closely resembles the more common eastern big-eared bat (P. rafinesquii), but with fur less grayish, and with tan beneath rather than white; upper incisors unicuspid rather than bifid and toes lacking the long hairs seen on the eastern species. This race differs from P. t. ingens in being smaller, and more grayish in coloration. and in a number of cranial details.

Present distribution: In the caves of Pendleton County, West Virginia, with a few colonies in neighboring counties. Also a colony in Tazewell County, Virginia, and one in Lee County, Kentucky.

Former distribution: Probably the same in recent times. Many of the caves within the major range have been abandoned.

Status: Numbers apparently stable.

Estimated numbers: About 5,000.

Breeding rate in the wild: A single young per season in June.

Reasons for decline: This race is a relict of a western species and has probably had a natural decrease in range during past geologic epochs. The species is very intolerant to human disturbance.

Protective measures already taken: None. The Forest Service, U.S. Department of Agriculture, is negotiating to obtain the private inholding housing the colony in Kentucky.

Measures proposed: Acquire some of the few remaining nursey caves and minimize human disturbance. None is now protected.

Numbers in captivity: None. All attempts to keep this species in captivity have been discouraging.

Breeding potential in captivity: Poor.

References:

Barbour, R. W., and W. H. Davis. 1969. Bats of America. Univ. Press of Kentucky, Lexington.

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Handley, Charles O., Jr. 1959. A revision of American bats of the genera Euderma and Plecotus. Proc. U.S. Natl. Mus. 110: 95-246.

Rippy, Charles L., and Michael J. Harvey. 1965. Notes on Plecotus townsendii virginianus in Kentucky. Jour. Mamm. 46(3): 499.

HAWAIIAN HOARY BAT — Lasiurus cinereus semotus (Peale and Beauvois)

Order: CHIROPTERA — Family: VESPERTILIONIDAE

Distinguishing characteristics: Very similar in coloration to the North American hoary bat (L. c. cinereus), but differs in smaller size. Reported to occur in two color phases, a gray or common phase, and a red phase; Tomich (1969), however, believes these differences may be due to conditions of age and wear rather than genetic anomaly.

Present distribution: Specimens recorded from Kauai, Oahu, Maui, and Hawaii, but probably occurs on all main islands at least sporadically, and casually in flight over offshore islets (Tomich, 1969).

Former distribution: Same.

Status: This is a non-social species, with a scattered population that may give the appearance of being less common than it actually is.

Estimated number in the wild: Possibly numbers a few thousand (Tomich, 1969: 24).

Breeding rate in the wild: Unknown.

Reasons for decline: Apparent loss of habitat due to removal of sheltering tree growth in many areas may have brought about a decline in numbers.

Protective measures already taken: Field research program underway to determine actual status and base guidelines for possible future action. Considered an endangered species by State of Hawaii; thus is protected by law.

Measures proposed: Strictly prohibit collecting even for legitimate scientific purposes; initiate or continue life history studies, possibly through a banding program.

Numbers in captivity: None known.

Breeding potential in captivity: Unknown.

References:

Tomich, P. Quentin. 1969. Mammals in Hawaii. Bishop Museum Press, Honolulu.

SPOTTED BAT — Euderma maculatum (J. A. Allen)

Order: CHIROPTERA — Family: VESPERTILIONIDAE

Distinguishing characteristics: A medium-size bat of spectacular appearance; large pink ears; black back with three white spots; ventral hair white tipped, black at base. Some individuals have white at the base of the ears and a black band on the lower, undersurface of the neck.

Present distribution: One or two records (except Texas and New Mexico, which have more) from each of the Southwestern States and the Mexican state of Durango. It has been found as far north as Yellowstone County, Montana, and Canyon County, Idaho, and as far east as Brewster County, Texas.

Former distribution: Probably same as present.

Status: A bat of the high cliffs and canyons (sedimentary origin?) living in the cracks and crevices during the day. Apparently highly selective in its roosts, yet ranges from ponderosa pine belt to Lower Sonoran Life Zone. This bat may prove to be more numerous than records indicate. However, until proven so, there is cause for concern.

Estimated numbers: None available, but the species appears to be extremely uncommon. About 70 individuals have been collected since the species was first described.

Breeding rate in the wild: A single young per year, probably born in spring, rarely in early summer (June).

Reasons for decline: Probably always was common.

Protective measures already taken: None.

Measures proposed: Continue research for information on habits, habitat, and distribution. David Easterla has recently been studying this species in southwest Texas and has successfully captured, observed, measured, banded, and released a number of spotted bats.

Number in captivity: None.

Breeding potential in captivity: Unknown, probably none.

References:

Barbour, Roger W., and Wayne H. Davis. 1969. Bats of America. Univ. Press of Kentucky, 161-163.

Constantine, Denny G. 1961. Spotted bat and big free-tailed bat in northern New Mexico. Southwestern Naturalist, 6: 92-97.

Easterla, David A. 1965. The spotted bat in Utah. Jour. Mamm., 46(4): 665-668.

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Jones, Clyde. 1961. Additional records of bats in New Mexico. Jour. Mamm., 42:538-539.

UTAH PRAIRIE DOG — Cyonmys parvidens (J. A. Allen)

Order: RODENTIA — Family: SCIURIDAE

Distinguishing characteristics: White-tailed, stout-bodied ground squirrels uniformly brown in color, with short legs and tail; usually living colonially in a "town."

Present distribution: Reported only from six counties in south-central Utah, at higher altitudes. Wayne, Garfield and Iron are the only counties with significant populations. (1972).

Former distribution: Always restricted to Utah; occurred in nine counties in 1935.

Status: Never widespread or abundant.

Estimated numbers: 48 dog towns covering 2,355 acres; total number of animals estimated at 5,715 (Collier and Spillett, 1972).

Breeding rate in the wild: 4 to 6 young per litter annually.

Reasons for decline: Damage and disease suppression; records of infection with sylvatic plague.

Protective measures already taken: Control personnel instructed to refrain from disturbing this species.

Measures proposed: None.

Number in captivity: Unknown.

Breeding potential in captivity: Probably good.

Remarks: The prairie dog is strictly vegetarian in feeding habits, but in large numbers it often ruins crops or natural vegetation.

References:

Collier, G. D., and J. J. Spillett. 1972. A legend in danger. Utah Science, 33(1):22-25.

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Matthiessen, P. 1959. Wildlife in America. Viking, N.Y., 304 pp.

Palmer, R. S. 1954. The mammal guide; Mammals of North America North of Mexico. Doubleday, Garden City, N.Y., pp. 170-172.

KAIBAB SQUIRREL — Sciurus kaibabensis (Merriam)

Order: RODENTIA — Family: SCIURIDAE

Distinguishing characteristics: A black tree squirrel, tassel-eared, white tail.

Present distribution: Kaibab plateau on north side of Grand Canyon, Arizona, an area of approximately 30 by 70 miles; closely associated with yellow pines. Apparently restricted to Kaibab National Forest and Grand Canyon National Park lands.

Former distribution: Probably the same since historic times.

Status: Restricted in range.

Estimated numbers: Approximately 4,000 in 1968 (Webb, 1969).

Breeding rate in the wild: One or two litters (3-4 each) annually.

Reasons for decline: Automobile traffic and disease the most conspicuous causes of mortality. Possibly the long history of complete fire prevention on the Kaibab area has resulted in a deterioration of the habitat for this species.

Protective measures taken: Complete legal protection for many years. North rim of Grand Canyon National Park serves as a sanctuary.

Measures proposed: Continue complete legal protection. Preservation of Gambel oak and yellow pine (squirrel feeds on the cambium layer). Efforts should be made to get a captive breeding program into operation.

Number in captivity: 5 to 10.

Breeding potential in captivity: Good.

Remarks: The squirrel population fluctuates from year to year for reasons unknown. Dr. Joseph G. Hall, who studied the species under sponsorship of the National Park Service, wrote on August 7, 1964, that, in his opinion, the population was at its highest about 30 years ago and that it "is now at its lowest ebb in a half century." The Arizona Game and Fish Commission believes that the status of this species is about optimum for its limited range and the species is not threatened.

References:

Allen, G. M. 1942. Extinct and Vanishing Mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Special Publ. 11, pp. 42-44.

Goldman, E. A. 1928. The Kaibab or white-tailed squirrel. Jour. Mamm., 9:127-129.

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Webb, P. M. 1969. Kaibab Squirrel--Rare and Endangered? Paper presented to New Mexico-Arizona Section of The Wildlife Society, Feb. 7 and 8, 1969.

DELMARVA PENINSULA (BRYANT) FOX SQUIRREL *Sciurus niger cinereus* (Linnaeus)

Order: RODENTIA Family: SCIURIDAE

Distinguishing characteristics: Similar to, but larger than, the gray squirrel; coloration uniform light grizzled-grayish above with a steel blue cast; belly and feet white; tail with a pronounced black stripe on outer edges. A melanistic form occurs in which the belly and back are black.

Present distribution: Queen Anne's, Dorchester, Talbot, Wicomico, Somerset, and Worcester Counties, Maryland. The center of population appears to be in the Drawbridge district of Dorchester County.

Former distribution: From southeastern Pennsylvania, south on the Delmarva Peninsula to Northampton County, Virginia.

Status: Occurs in limited numbers in restricted areas. Flyger (1964) considered this race as "threatened with immediate extinction."

Estimated numbers: 200 on Blackwater National Wildlife Refuge, Maryland; 250 on Eastern Neck National Wildlife Refuge, Maryland; 18 on Chincoteague National Wildlife Refuge, Virginia and Maryland.

Breeding rate in the wild: One or two litters of two to four young per year.

Reasons for decline: Destruction of habitat through timber cutting, construction, road building, forest fires, etc.

Protective measures already taken: Establishment of the Blackwater National Wildlife Refuge (1933) and of the Pocomoke State Forest has helped to preserve some habitat. Introduced to Chincoteague National Wildlife Refuge in 1968. Lecompte Wildlife Management Area designated as refuge for species by the State of Maryland in 1970. The State of Maryland closed the hunting season on this squirrel for 1971.

Measures proposed: Initiate studies to determine optimum habitat requirements. Enlarge refuges on the Delmarva Peninsula to protect and develop optimum habitat.

Number in captivity: Unknown.

Breeding potential in captivity: Probably good.

Remarks: The scientific name of this race has changed several times in recent years. Thus, it is often known in the literature as *Sciurus n. bryanti* or *S. n. neglectus*.

References:

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EVERGLADES FOX SQUIRREL — *Sciurus niger avicennia*

Order: RODENTIA — Family: SCIURIDAE

Distinguishing characteristics: Coloration grades from black on the head and shoulders to brown with an orange wash on the sides, rump, and tail. The belly is orange or black washed with orange. This combination differs markedly from the fox squirrels of central and northern Florida which are much paler on the belly and back. A melanistic form of the Everglades fox squirrel occurs in which the entire pelage is black except for some white on the nose.

Present distribution: Found only in the Big Cypress Swamp and adjacent pinelands of southwestern Florida (Collier and northwestern Monroe Counties).

Former distribution: Across all of southern Florida south of Lake Okeechobee in suitable habitat. It was present in Dade and Broward Counties until the early 1900's. There are no recent records of its occurrence in those portions of Everglades National Park where it once was found.

Status: Occurs in low numbers in restricted areas.

Estimated numbers: Not possible to accurately estimate, but certainly no more than a few hundred.

Breeding rate in the wild: Not known, but probably one or two litters per year of two to four young each.

Reasons for decline: Habitat destruction as result of logging mature pine and cypress forests brought about its early decline. Continued bulldozing of trees and development of natural habitats in and around the Big Cypress Swamp are eliminating remaining populations. Complete fire protection in pine woodlands has resulted in growth of dense understory vegetation consisting of palmettos and broadleaf trees. Fox squirrels in Florida do not fare well unless the understory vegetation is open and sparce.

Measures proposed: Initiate studies to determine optimum habitat requirements; conduct control burns in the pinelands to open up the understory; establish refuges in the Big Cypress Swamp area to protect and develop optimum habitat.

Number in captivity: None probably.

Remarks: This subspecies is sometime referred to as the Mangrove fox squirrel, because it is occasionally sighted in the mangrove zone along the southwest coast of Florida. However, because of the absence of nesting cavities or suitable food, this squirrel cannot be considered permanent residents of the mangrove zone.

Over the last few years, L. N. Brown has surveyed various habitats of the Big Cypress Swamp region for evidence of *S. niger avicennia*. Only a few scattered populations of low densities were found. The only protected population known is located in the Corkscrew Swamp Sanctury of the National Audubon Society situated in northern Collier County. It is also possible that a few fox squirrels remain in the remote northern portions of Everglades National Park, but this has not been verified.

This squirrel is very vulnerable to decimation by hurricanes, as evidenced by the devastation wrought by Hurricane Donna in 1960. The famous "town-squirrel" population reported by Moore (1954) in the Everglades City area was virtually wiped out by this hurricane and have not yet repopulated to its previous level.

The scarcity and decreasing range of the Everglades fox squirrel has been documented by both Schwartz (1952) and Moore (1956).

References:

Brown, L. N. 1971. Everglades fox squirrel rare and becoming rarer. Florida Wildlife.

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MORRO BAY KANGAROO RAT — Dipodomys heermanni morroensis (Merriam)

Order: RODENTIA — Family: HETEROMYIDAE

Distinguishing characteristics: "The darkest colored of all known kangaroo rats" (Grinnel, 1922). "The dark coloration of D. h. jolonensis is further intensified in D. h. arenae and reaches an extreme in morroensis" (Boulware, 1943). Dorsal color tawny-olive, clearest on sides and strongly overwashed with blackish on tops and sides of head and down middle of back; facial cresents broad, continuous and jet black, involving whole top of nose for at least 5 mm.; dorsal and ventral tail stripes almost solid black and very broad, each more than twice width of either white lateral stripe; tail weakly crested and tufted; white band across outer side of flank usually incomplete or lacking.

Present distribution: Restricted to sandy soils comprising an area of about 1.7 square miles on the south side of Morro Bay, San Luis Obispo County, California.

Former distribution: Probably about the same since historic times, but possibly also including an area on the north side of Morro Bay.

Status: Suitable habitat now reduced to approximately 2 square miles; habitat destruction continuing.

Estimated numbers: Population density estimated to average five per acre; total population probably less than 3,000.

Breeding rate in the wild: Breeding activity is greatest during the spring and summer, but some breeding may also occur during the fall and winter. Females probably bear one or two litters annually, each containing two to four young.

Reasons for decline: Destruction of habitat, especially by community development; predation by house cats.

Protective measures already taken: Taking and possession prohibited by State law. Extension of Montana de Oro State Park places additional habitat under public stewardship.

Measures proposed: Establishment of proposed Morro Bay Ecological Reserve would provide additional protection.

Number in captivity: Unknown, but probably very few.

Breeding potential in captivity: Probably fairly good with proper facilities and management.

Remarks: This kangaroo rat is closely restricted to moderately compacted, sandy soils covered by fairly open scrub vegetation. Its range is bordered by coastal sand dunes, salt marsh, cultivated land, and chaparral. Some chaparral areas exist within the range and can be temporarily colonized following fires. Significant range extensions are prevented, however, by surrounding hard soils. Destruction of the habitat began in the early

1900's with the planting of several large groves of eucalyptus trees. Continuing growth of a retirement community and increasing use by dune buggy enthusiasts threaten to destroy most of the remaining habitat.

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SALT-MARSH HARVEST MOUSE — Reithrodontomys raviventris

Order: RODENTIA — Family: CRICETIDAE

Distinguishing characteristics: External measurements: 135-162; 64-88, 16-19. Upper parts pinkish cinnamon interspersed with black hairs, especially middorsally; underparts pinkish cinnamon or whitish; hind feet dark brown or whitish; tail dark brown or blackish above, paler, sometimes almost white, below. As compared with R. megalotis longicaudus, its geographically nearest congener, R. raviventris differs cranially in larger skull with relatively shorter rostrum; nasals and incisive foramina shorter; and zygomata more widely spreading anteriorly.

This unusually dark-colored harvest mouse lives in the salt marshes where the ground is damp or wet and the marsh plants form a thick mat over a network of interstices.

Present distribution: Restricted to salt marshes bordering San Francisco, San Pablo and Suisun Bays in areas where the salt marshes are not heavily diked on the upland side. The remaining marshes with moderate populations include those near Petaluma, San Pablo Bay near Vallejo, Grizzly Island in Suisun Bay, Point San Pedro, Dumbarton in South San Francisco Bay, Alviso and the Palo Alto-Redwood City marshes of the South San Francisco Bay.

Former distribution: Extensive marshes bordering the San Francisco, San Pablo and Suisun Bays. Especially prevalent throughout the Petaluma-Napa areas as well as the Gallinas, Corte Madera and Petaluma Creek areas of the San Pablo Bay. The marshes on both north and south shores of the Suisun Bay and most of the South San Francisco Bay, especially in the extensive marshes which extended from the present city of Oakland around the bay up to the areas now known as San Mateo and Burlingame.

Status: Population low, natural range greatly restricted, once continuous distribution now broken up into small isolated populations, destruction of remaining suitable habitats has been accelerated over the last two decades.

Reasons for decline: Most of its habitat destroyed by urban and industrial land fills and salt production ponds.

Protective measures already taken: Taking and possession prohibited by State law. Establishment of South San Francisco Bay National Wildlife Refuge and acquisition of Tubbs Island by The Nature Conservancy.

Measures proposed: Continue with acquisition of key areas already started.

Number in captivity: Few animals occasionally held for study in the Museum of Vertebrate Zoology, University of California, Berkeley, and the Department of Biological Sciences, San Jose State College, San Jose, California.

References:

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KEY LARGO WOODRAT — Neotoma floridana smalli

Order: RODENTIA — Family: CRICETIDAE

Distinguishing characteristics: Coloration is gray-brown on the back and head with the belly and throat white. The ears are large and bare and the tail is covered with short bristle-like fur. Sherman (1955) reported that the skull morphology differed slightly from that of the nearest eastern woodrats in central and northern Florida.

Present distribution: Found only in "climax hammock" vegetation restricted to the northern portion of the island of Key Largo, Monroe County, Florida.

Former distribution: At one time occupied the entire length of the island of Key Largo, Florida, which is 35 miles long and only one-half to two miles wide (Schwartz, 1952). No woodrats other than this relict population occur in all of southern Florida.

Status: Seriously depleted. Only a few hundred acres of suitable climax vegetation remain on North Key Largo. Trapping has revealed that the woodrats do not occur in any of the early to mid-successional stages of subtropical hammock. The only populations which remain in existence, occur on the northern end of the island (see attached map of Key Largo).

Estimated numbers: Not possible to say precisely, but one study plot in prime habitat averaged one woodrat per each two acres. The amount of climax subtropical forest remaining in North Key Largo is decreasing rapidly due to bulldozing and would not presently exceed 1,500 acres. Thus, the total population of this woodrat is presently estimated to be between 700 and 800 individuals.

Breeding rate in the wild: Two litters per year averaging two young each are produced by mature females. The chief sources of mortality in the young as well as adults appear to be rattlesnakes, raccoons, and owls.

Reasons for decline: Habitat destruction by man on an island where the amount of climax vegetation is not extensive anyway. Repeated fires and bulldozing for commercial development have eliminated this woodrat entirely from the southern two-thirds of Key Largo. A decline in the total population has also been recorded during four years (1968-72) of study on North Key Largo.

Measures proposed: Preservation in public ownership of some of the remaining climax subtropical forest restricted to North Key Largo. If this is not accomplished this species could probably be successfully introduced to suitable "protected" islands nearby having climax subtropical forest. The islands of Biscayne Bay National Monument located just north of Key Largo appear to be suitable for this possibility.

Number in captivity: None presently. From 1968 to 1970, a breeding colony was maintained at the University of South Florida, Tampa.

Remarks: The Key Largo woodrat builds very large and conspicuous "stick nests" on the ground which sometimes approach the size and configuration of small beaver lodges. These nests are apparently used and added to by successive generations of woodrats, and often measure four feet high and six to eight feet in diameter. Only one adult woodrat is found occupying each active nest which suggests territorality.

The Key Largo deer mouse (Peromysius gossypinus allapaticola) is a small-bodied companion species of the woodrat and shares its current plight. Its range is also confined to Key Largo and its habitat is the climax subtropical forest.

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BLOCK ISLAND MEADOW VOLE — Microtus pennsylvanicus provectus (Bangs)

Order: RODENTIA — Family: CRICETIDAE

Distinguishing characteristics: Minute differences (larger; gray belly) from the common meadow vole of mainland.

Present distribution: Block Island, Newport County, Rhode Island. Voles are present on 602 acres, or about 9 percent of the total available area on Block Island, where they are most abundant in vegetation dominated by beachgrass (Ammophila) and in abandoned fields containing uncut grass and herbs; about 335 acres of optimum vole habitat are available (Clough and Fulk, 1971).

Former distribution: Same.

Status: Reportedly reduced in numbers since early days. Clough and Fulk (1971) report that "there is a secure reservoir population."

Estimated numbers: Apparently reached a high level in 1965, and have since declined. Live-trapping in November 1965 produced 33 voles (0.89 per 100 trap-hours); in May 1967, 20 voles (0.50); in November 1969, 23 voles (0.27). (Clough and Fulk, 1971).

Breeding rate in the wild: Several litters of five to seven annually.

Reasons for decline: Construction of buildings and roads on island; effects of storms and hurricanes. Hotels and cottages for the tourist trade, and accompanying development of dairy farming, altered and reduced the habitat for voles; tourism and farming have declined in the last few decades. (Clough and Fulk, 1971).

Protective measures already taken: None.

Measures proposed: Measures should be taken to encourage the continued existence of suitable perennial grass habitat. Clough and Fulk (1971) recommend securing as much of the existing beachgrass and wetland habitats as possible, and maintaining them free from disturbance.

Number in captivity: Unknown.

Remarks: Forty-three were collected in 1952 (Chamberlain).

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BEACH MEADOW VOLE — Microtus breweri (Baird)

Order: RODENTIA — Family: CRICETIDAE

Distinguishing characteristics: Larger and paler in color than common meadow vole.

Present distribution: Muskeget Island off Nantucket, Massachusetts.

Former distribution: Muskeget, including Adams and South Point Islands.

Status: Apparently persisting on Muskeget; one collected 1956 (Haft).

Estimated numbers: Populations fluctuate; apparently at a fairly high level in early 1965.

Breeding rate in the wild: Several litters (usually five to seven young) annually.

Reasons for decline: Predation by short-eared owls and by cats kept at Life Saving Station. Habitat eliminated by erosion after storms and by construction.

Protective measures already taken: Muskeget Island now a refuge for nesting terns.

Measures proposed: Encourage suitable perennial grass habitat. Continue maintenance of refuge. Elimination of cats.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

Remarks: On Muskeget Island, "excessively abundant" in 1869; "only a few" in 1890; "no trace" of them in 1891; a "thriving colony" in 1892; "entirely disappeared" in 1893, when G. S. Miller transplanted a few from nearby South Point Island. Apparently the population underwent violent fluctuations, as do meadow voles on the mainland. This species is especially adapted for digging in sand.

References:

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WHALES

Order: CETACEA

Toothed Whales (Suborder Odontoceti)
Baleen Whales (Suborder Mysticeti)

Among the animals threatened with extinction, the whales present a special case. It seems impractical here to consider them in the same manner as the other mammals. Except for the sirenians, these large, intelligent animals are the earth's only completely aquatic mammals; from birth to death they live in a marine environment. All the species, presently threatened, are the so-called Great Whales. These large mammals have been ruthlessly exploited by a loosely regulated whaling industry for decades. It is primarily this exploitation that has pushed some species of whales to the brink of extinction and seriously threatens others. The Great Whales spend at least part of their life on the high seas; they are an international resource and no nation has complete jurisdiction over them.

The whales received some consideration under the 1937 International Convention for the Regulation of Whaling, when the Convention established an International Whaling Commission. That Commission was provided limited management capacity and little enforcement authority. Membership in the Commission is voluntary. Many whaling nations are not members; therefore, are not subject to the Commission's regulations.

It is only during recent years that some of the whaling nations have acknowledged their obligation to manage whale stocks in a responsible manner. In 1971, some whaling nations agreed to allow international observers aboard their whaling vessels and to inspect their whaling stations to insure better compliance with whaling agreements. Serious consideration is now being given to conducting research in an effort to determine the status of various species of whales and to manage them in accordance with research findings. It is only when such knowledgeable management programs become realities that we can assume the threat of extinction has lessened.

With exception of the sperm whale, all species in American waters that are in jeopardy are baleen whales (suborder Mysticeti); the sperm is a toothed whale (suborder Odontoceti).

SPERM WHALE or CACHALOT, Physeter catodon (Linnaeus). Polar, temperate and tropical seas; occurs off both the Atlantic and Pacific coasts of North America. Still widely hunted; not protected by international agreement. Considered of special concern because of the numbers that are being commercially taken, and because of lack of international protection.

GRAY WHALE, Eschrichtius robustus (Lilljeborg). Distributed in eastern North Pacific, Alaska to Baja California; also a population in western North Pacific. Populations of this whale were severely depleted during the 19th century by over-exploitation. Protection provided by a 1938 international agreement has helped the gray whale recover. The eastern Pacific population appears stable, although concern still exists over the status of the western Pacific population. The increasing numbers and apparent stable population is a good example of the ability of an animal to recover when adequate protection is provided. Considered as in need of attention because of concern over western Pacific population and lack of effective management programs.

BLUE WHALE, Balaenoptera musculus (Linnaeus). Cosmopolitan; occurs along both the Atlantic and Pacific coasts of North America. Numbers greatly reduced through excessive exploitation; protected by international agreement since 1966. Status a matter of special concern because of decimation of numbers prior to protection and apparent scarcity of the species at the present time.

FINBACK WHALE, Balaenoptera physalus (Linnaeus). Cosmopolitan; occurs along both the Atlantic and Pacific coasts of North America. Still widely hunted; not protected by international agreement. Considered in peril because of uncertainty of the effects of continued exploitation, and lack of international protection.

SEI WHALE, Balaenoptera borealis Lesson. Cosmopolitan; occurs off both the Atlantic and Pacific coasts of North America. Still widely hunted; not protected by international agreement. Considered jeopardized because of the effects of widespread exploitation, and the lack of adequate protection.

HUMPBACK WHALE, Megaptera novaeangliae (Borowski). Cosmopolitan; occurs along both the Atlantic and Pacific coasts of North America. Numbers greatly reduced because of excessive exploitation prior to protection; protected, since 1966, by international agreement. Considered in need of special attention due to greatly reduced population.

RIGHT WHALE, Eubalaena glacialis (Muller). Polar, temperate and tropical seas; in North America roughly from Iceland to Bermuda in the western Atlantic, and from Alaska to Baja California in the eastern Pacific. Population may now be stable; protected by international agreement. Considered in need of attention because of greatly reduced numbers.

BOWHEAD WHALE, Balaena mysticetus (Linnaeus). Northern oceans, south to the Pribilof Islands and the Gulf of St. Lawrence. Greatly depleted in numbers; protected by international agreement and population may now be stable. Considered as in need of careful watching because of its low population level.

References:

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NORTHERN ROCKY MOUNTAIN WOLF — Canis lupus irremotus (Goldman, 1937)

Order: CARNIVORA — Family: CANIDAE

Distinguishing characteristics: A medium to large subspecies of wolf generally light in color, with hair tips gray or black.

Present distribution: Although irremotus has been considered extinct in the U.S., wolves in the former range of irremotus have recently been reported from Yellowstone National Park, Glacier National Park, and the following National Forests: Boise, Challis, Flathead, Gallatin, Helena, Kootenai, Salmon, Shoshone, Teton, Custer, Beaverhead and Targhee. Reports are based on sightings and tracks. Nowak (pers. comm. 1973) has identified a specimen taken in Lewis and Clark County, Montana in 1964 as being Canis lupus irremotus.

Former distribution: All of Montana except northeastern third; Black Hills of South Dakota; northern two-thirds of Wyoming; all of Idaho; eastern third of Oregon and Washington; southern third of Alberta; and southeast corner of British Columbia.

Status: Present small numbers in wildly scattered groups represent a remnant population at best.

Estimated numbers: The best estimate, based on scattered reports, is that fewer than 20 individuals, mostly loners or pairs, are known to exist although up to five in one group were seen in Yellowstone National Park.

Breeding rate in the wild: Probably an average litter size of five to six, as with other subspecies. Sexual maturity at 2 or 3 years of age.

Reasons for decline: Land development, including loss of habitat, poisoning, trapping and hunting, and the wolf's inability to adapt to most of man's development activities.

Protective measures already taken: Preliminary mail survey to check reports of the remnant population; complete legal protection in Yellowstone and Glacier National Parks.

Measures proposed: Invoke protective regulations for all lands within the former range of this animal.

Number in captivity: Unknown.

Breeding potential in captivity: Probably good.

Remarks: Distinguishing one subspecies from others requires examination of skulls, so it cannot be stated with certainty that the wolves reported in the former area of C. l. irremotus actually belong to that subspecies. However, since most of the present reports are from the center of the former range of irremotus, the best judgment is that they represent members of irremotus descended from those few individuals in that back country that escaped persecution in the thirties, forties and fifties. However, the possibility always remains that the reported wolves are really migrants of other subspecies, or are accidental or deliberate transplants of other subspecies by human beings.

References:

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EASTERN TIMBER WOLF — Canis lupus lycaon (Schreiber)

Order: CARNIVORA — Family: CANIDAE

Distinguishing characteristics: A large, broad-headed wild canid with thick, rich fur of grizzled gray coloration.

Present distribution: The Lake Superior region of Michigan and the International border region of Minnesota; Isle Royale, Michigan; Ontario, Canada, north to James Bay, eastward to Gulf of St. Lawrence. One specimen was taken in 1968 in Fulton County, New York; prior to that, the last authentic record of the wolf in New York was in 1899.

Former distribution: Minnesota and eastern Canada south to Ohio and the Northeastern United States.

Status: Greatly reduced in range and numbers in the conterminous United States, but stable in Minnesota.

Estimated numbers: As of October 1969, 12 or less in Michigan exclusive of Isle Royale, where there were at least 20 in 1970; 500 to 1000 in Minnesota in January 1970 according to Bureau of Sport Fisheries and Wildlife estimate; approximately 300 wolves in Superior National Forest.

Breeding rate in the wild: An average litter size of seven, not necessarily annual in frequency.

Reasons for decline: Heavy hunting and trapping pressure for bounty. Modification of large areas of suitable primitive habitat by commercial interests. Encroachment of civilization.

Protective measures already taken: Complete legal protection in Michigan; Use of snares, aerial hunting and poisoning illegal in Minnesota. Bounty has been reduced to a localized basis only in Minnesota.

Measures proposed: Removal of all wolf bounties. Restocking wilderness areas where the environment is compatible and there would be minimal conflict with farmers or cattle industry; locate remnant populations and take measures to preserve the habitat in such areas. Discourage private action against depredation losses.

Number in captivity: A least 22 specimens in six zoos (1963), probably more.

Breeding potential in captivity: About as in the wild state.

Remarks: Most other subspecies, except those inhabiting Alaska and Canada, are similarly reduced. Bureau of Sport Fisheries and Wildlife personnel report indications that a remnant wolf population (C. l. irremotus?) is present in Wyoming; officials at Yellowstone National Park report 22 sightings dating back to 1955. Mech lists 24 subspecies in North America and 8 in Europe, of which 6 are extinct. Minnesota State officials do not believe wolves are endangered.

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Young, S. P., and E. A. Goldman. 1944. The wolves of North America. Wildlife Management Institute, Wash., D.C.

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MEXICAN WOLF — Canis lupus baileyi (Nelson and Goldman)

Order: CARNIVORA — Family: CANIDAE

Distinguishing characteristics: A very small, dark wolf, the smallest wolf in North America; face very short, and cheeks wide. Weight of males under one hundred pounds; females under seventy.

Present distribution: Extreme southern Arizona, east to west Texas, south to San Luis Potosi in Mexico.

Former distribution: About the same as present distribution, but within this range the Mexican wolf has been eliminated from many areas.

Status: Apparently extirpated in the United States during the 1940's, but the species has reappeared in recent years in Arizona and Texas.

Estimated numbers: Not known; at least six specimens have been reported in Arizona and Texas since 1968.

Breeding rate in the wild: The same as for other wolves. They do not breed until they are two to three years old; the gestation period is from 60 to 63, with the average litter size being seven.

Reasons for decline: Heavy hunting and trapping pressure to eliminate the wolf as a predator on domestic livestock.

Protective measures already taken: Defenders of Wildlife has paid livestock damage costs, and is attempting to purchase land; Federal predator control operations have ceased in the area. "The Arizona Game and Fish Department protects wolves in Arizona with a no open season regulation."

Measures proposed: Locate areas where populations occur; educate the public to avoid hunting and trapping of wild canids in these areas; establish sanctuaries in west Texas and eastern Arizona to protect resident populations and/or migrants from Mexico.

BNumber in captivity: None.

Breeding potential in captivity: Probably good.

Remarks: Two animals taken in western Texas in 1968 have been definately identified as Mexican wolves (C. lupus baileyi) by Paradiso and Nowak. It is not now known, however, whether the wolves in Arizona and Texas are remnant native populations, or are migrants from Mexico; E. L. Cockrum of the University of Arizona, believes that the Arizona population is a remnant native.

References:

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Mech, l. D. 1970. The wolf. Natural History Press, Garden City, New York.
Young, S. P., and E. A. Goldman. 1944. The wolves of North America, America Wildlife Institute, Washington, D.C.

RED WOLF — Canis rufus (Audubon & Bachman)

Order: CARNIVORA — Family: CANIDAE

Distinguishing characteristics: A medium-sized, slender, wild canid resembling the coyote but larger and more robust; legs and ears relatively longer than in coyote; occurs in two color phases; common and black. Coloration in common phase similar to that of coyote, but tawny element more pronounced; pelage usually somewhat coarser than that of coyote. Slightly smaller than gray wolf (C. lupus), with a more slender and elongated head. Pelage shorter and coarser than in any race of lupus. Legs appear to be longer and ears bigger but actually they are not.

Present distribution: Extirpated throughout its former range except in eastern Texas and Louisiana. Here, it appears to have hybridized in most areas with coyotes and domestic dogs. Pure populations are thought to occur only in four southeastern Gulf Coast counties of Texas and adjacent Louisiana.

Former distribution: Southeastern United States from Florida to central Texas, and north to southern Indiana.

Status: Extremely small numbers and greatly restricted in distribution.

Estimated numbers: The red wolf was long thought to be more numerous in Texas than it actually was because many coyotes were erroneously identified as red wolves. Its apparent hybridization with coyotes and dogs has also led to confusion with regard to its actual numbers.

Breeding rate in the wild: Unknown; probably similar to that of the coyote.

Reasons for decline: Apparently stereotyped and habitual behavioral patterns rendered the animal vulnerable to trapping and hunting pressures. Habitat changes favor the coyote, with which red wolves appear to readily hybridize. Inability of red wolves to compete with the more aggressive coyote that has expanded its range into red wolf territory. Mange, intestinal parasites and heart worms infest much of the population.

Protective measures already taken: Assignment of field personnel to investigate the problem, resulted in the discovery of a few pure populations in the coastal prairie marshes of the northeastern Texas Gulf Coast. About 300 animals are resident in this region. Management area established in Liberty, Galveston, Harris, Chambers, Jefferson, and Orange Counties, Texas, plus area of Brazoria east of Brazos River and Cameron and Vermilion Parishes, Louisiana, in which only known livestock killers are controlled by Federal agents. These depredating animals are removed alive and transferred to the Wild Animal Propagation Trust of the American Association of Zoological Parks and Aquariums. Education program now underway to discourage control by private individuals.

Measures proposed: Additional field work to determine the total limits of pure populations of red wolves. Investigate means of placating ranchers in areas where red

wolves cause livestock damage, to prevent ranchers resorting to private control measures. More widely publicize through the popular press the uniqueness of the red wolf and its precarious status. Obtain additional refuge lands in coastal prairie areas, supplemental to those in the present Anahuac and Brazoria National Wildlife Refuges. Maintain good breeding stock in captivity (zoos, Patuxent Wildlife Research Center, etc.) for possible restocking in case of sharp declines (due to rabies, flooding, hybridization with coyotes, etc.) in the wild, and for biological studies of reproduction, behavior, etc.

Number in captivity: Uncertain; many alleged red wolves may be coyotes or coyote-red hybrids. Sixteen known red wolves in five zoos (Ogilvie 1969).

Breeding potential in captivity: Not known; probably good.

Remarks: Pure populations of red wolf today are known only from the coastal prairie marshes of east Texas and adjacent Louisiana. All efforts should be made to preserve these marshes in their present state. Most recent field information (1971), however, strongly suggests that coyotes are now present throughout this area, and perhaps hybridizing with red wolves, a situation not evident two years ago. The future has been considerably dimmed by this new factor.

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SAN JOAQUIN KIT FOX — Vulpes macrotis mutica (Merriam)

Order: CARNIVORA — Family: CANIDAE

Distinguishing characteristics: A small desert dwelling fox, with buffy yellow coloration over the body; tail black tipped; feet no darker than rest of body. Males weigh 5.0 pounds and females 4.6 pounds. Similar to Nevada kit fox, but slightly larger.

Present distribution: Foothills below 2,000 feet and areas of native vegetation on the west side of San Joaquin Valley in Merced, Fresno, Kings, Tulare, and Kern Counties, California.

Former distribution: Drier parts of San Joaquin Valley from Tracy south.

Status: Population low, natural range restricted; 34 percent reduction in habitat between 1960 and 1970 and trend continuing. Two million acres of habitat in 1970.

Estimated numbers: Probably 1,000 to 3,000 animals altogether. One den per 2.07 square miles in atriplen plant communities.

Breeding rate in the wild: Average litter size four. Breeds during second year.

Reasons for decline: Primarily, reduction of former rough, dry valley land habitats to highly developed, irrigated agriculture. Susceptible to certain rodenticides, which have been used in the area. Most recent threat comes from irresponsible use of "game calls" to attract them to gunfire and illegal trapping.

Protective measures already taken: Classed as rare by California Department of Fish and Game. Life history study by California Department of Fish and Game under the Federal Aid in Wildlife Restoration program (P.R. project) in cooperation with Bureau of Sport Fisheries and Wildlife completed. Taking and possession prohibited by State law. Night hunting prohibited over much of this animals' range.

Measures proposed: Continue efforts to re-establish fox on suitable areas. Designation of Elk Hills Naval Petroleum Reserve as an Ecological Reserve by action of the California Fish and Game Commission.

Number in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

Grinnel, D. and L. 1937. Fur-bearing mammals of California. Univ. Calif. Press, 2 vols.

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Morrell, S. 1971. Life history of the San Joaquin kit fox. Calif. Dept. of Fish & Game, Admin. Report.

_____. 1972. Life history of the San Joaquin kit fox. Calif. Dept. of Fish & Game, 58(3):162-174.

GLACIER BEAR — *Ursus americanus emmonsii* (Dall)

Order: CARNIVORA — Family: URSIDAE

Distinguishing characteristics: This grayish or bluish bear is thought to be a small color phase of the common black bear, restricted to southern Alaska and northern British Columbia.

Present distribution: Mainland of Alaska from the Upper Copper River and Matanuska River Valleys southeastward at least to Tracy Arm and the mouth of the Chickamin River.

Former distribution: Same.

Status: Restricted in range and limited in numbers, but the population appears to be stabilized.

Estimated numbers: About 500.

Breeding rate in the wild: One to two cubs in alternate years.

Reasons for decline: Overhunting as a curio, and its circumscribed range.

Protective measures already taken: Glacier Bay National Monument serves as a refuge. Hunting of black and glacier bears in Alaska Units 1-5 is prohibited during July and August; no more than one glacier bear may be taken per hunter per year. The taking of cubs, or females accompanied by cubs, is prohibited. In addition, no glacier bear skins may be sold.

Measures proposed: Adequate patrolling to prevent poaching.

Breeding potential in captivity: Thought to be good.

Number in captivity: One male in San Diego Zoo (1972).

References:

Allen, G. M. 1942. Extinct and vanishing mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Spec. Publ. 11, pp. 135-138.

Matthiessen, P. 1959. Wildlife in America. Viking, N. Y., p. 89.

GRIZZLY BEAR — Ursus arctos horribilis (Ord)

Order: CARNIVORA — Family: URSIDAE

Distinguishing characteristics: Large bear, average about 600 pounds for males; grizzled brown, hump on shoulder, huge front claws, concave facial profile.

Present distribution: Colorado (questionable if any remain), Idaho, Wyoming, Montana, and Washington.

Former distribution: In addition to presently inhabited areas, the grizzly previously occupied suitable habitat in all of the Western States from the Pacific Ocean to the eastern edge of the Rocky Mountains.

> Note: The taxonomic status of the grizzly is confused (see "remarks" below). The grizzly and big brown bear of Alaska are closely allied, and 77 species of the two combined have been described. Some of these are now extinct, while others are doubtless synonyms. What we here refer to as the grizzly bear, Ursus horribilis (with 4 subspecies included), represents populations from Idaho, Colorado, Montana, and Wyoming.

Status: Occurs in small numbers in the conterminous United States. The population trend has been static in the last decade.

Estimated numbers: Idaho, 10; Montana, 375 to 700; Wyoming, 300; and a few in Colorado. About 10 in Washington in 1970 (Lauckhardt).

Breeding rate in the wild: Usually 1 to 2 cubs in alternate years.

Reasons for decline: Numbers have been killed with guns, traps, dogs, and poisons as predator and menace to man and his livestock. Human activity continues to intrude on the habitat of this wilderness species, that is apparently unable to adapt to most of man's activities.

Protective measures already taken: Complete protection in Washington, Colorado and Idaho; managed by State as a game animal in Montana and Wyoming with very restrictive regulations. Complete protection by Federal Government in National Parks.

Measures proposed: Wilderness areas most needed, with cessation of any unnecessary persecution as a predator.

Number in captivity: 33 males and 53 females in 31 American zoos (1963).

Breeding potential in captivity: Good.

Remarks: Last grizzly reported in California in 1922. The taxonomy of the grizzly and brown bears is confused and clarification is greatly needed. It is currently being reviewed by E. R. Hall and has been studied previously by R. L. Rausch.

References:

Allen, G. M. 1942. Extinct and vanishing mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Spec. Publ. 11, pp. 139-165.

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Cowan, I. M. 1972. The status and conservation of bears of the world--1970. in Bears--Their Biology and Management. I.U.C.N. Publs. news series No. 23, pp. 343-367.

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National Wildlife Federation. 1956. Our endangered wildlife, pp. 3-4.

Matthiessen, P. 1959. Wildlife in America. Viking, N.Y., pp. 87-90.

Palmer, R. S. 1954. The Mammal Guide; Mammals of North America North of Mexico. Doubleday, Garden City, N.Y., pp. 83-88.

Rausch, R. L. 1953. On the status of some Arctic mammals. Arctic, 6(2): 91-148.

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BLACK-FOOTED FERRET — Mustela nigripes (Audubon and Bachman)

Order: CARNIVORA — Family: MUSTELIDAE

Distinguishing characteristics: A large weasel with black feet and face mask.

Present distribution: Western North and South Dakota to northern Montana and Alberta, south to Texas and central New Mexico.

Former distribution: Great Plains, Alberta and Saskatchewan to Texas and Arizona, to 10,500 feet in the Rockies; in association with prairie dogs.

Status: Very few observations have been reported. The species apparently never was abundant.

Estimated numbers: Since 1955, confirmed sightings have been made in 26 counties in South Dakota, one (Burleigh) in North Dakota, one in Nebraska, one in Texas, one in Wyoming, and one (possibly two) in Colorado.

Breeding rate in the wild: Probably one litter of 4 to 5 young.

Reasons for decline: Significant data are not available on population history of the black-footed ferret. If a decline is to be assumed, the following causes are likely: elimination of natural prey and den holes; destruction of original grasslands; shot by people hunting prairie dogs for sport; possibility of disease, particularily distemper; since 1955 eleven road kills have been reported.

Protective measures already taken: Protected by law in some States. Life history and ecology studies of individuals in the wild are underway by South Dakota Cooperative Wildlife Research Unit and the National Park Service, and also by the Bureau of Sport Fisheries and Wildlife. Prairie dog towns must be determined to be "ferret free" before the Bureau undertakes damage suppression measures. "Sikes Act Agreement" signed with South Dakota Department of Game, Fish and Parks and Defense Department to protect ferrets on 42,000-acre Air Force Aerial Gunnery Range.

Measures proposed: Legal protection; preservation of grassland habitat and of prairie dog towns where ferrets are present. Establishment in sanctuaries (Wind Cave National Park, South Dakota; Theodore Roosevelt National Memorial Park, North Dakota; and Charles M. Russell National Wildlife Range, Montana, have been suggested). Attempt to bring more into captivity for breeding purposes.

Number in captivity: Three; 2 males and 1 female (December 1972).

Breeding potential in captivity: Unknown.

Remarks: Research into the animal's status, life history, and ecology is being conducted by the Bureau of Sport Fisheries and Wildlife throughout its entire former range.

References:

Allen, G. M. 1942. Extinct and vanishing mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Spec. Publ. 11, pp. 183-186.

Cahalane, V. H. 1954. Status of the black-footed ferret. Jour. Mamm., 33: 418-424.

Charles, G. 1965. Our vanishing species: Will they survive? S. Dak. Conserv. Digest, 32(2): 6-8.

Fortenbery, D. K. 1972. Characteristics of the black-footed ferret. Bureau of Sport Fisheries and Wildlife, Resource Publ. 109. 8 pp.

Hall, E. R., and K. R. Kelson. 1959. The mammals of North America. Ronald Press, N.Y., Vol. 2, pp. 914-916.

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Sheet, R. G., R. L. Linder, and R. B. Dahlgren. 1972. Food habits of two litters of black-footed ferrets in South Dakota. American Midland Naturalist 87(1): 249-251.

SOUTHERN SEA OTTER — Enhydra lutris nereis (Meriam)

Order: CARNIVORA — Family: MUSTELIDAE

Distinguishing characteristics: Large marine otter, about 4 feet long, dark brown with short stout tail.

Present distribution: Off California coast, Santa Barbara County to Santa Cruz County.

Former distribution: Pacific Coast, Washington to central Baja California.

Status: Once nearly extinct, but now recovering on California Coast; extirpated off Washington and Oregon since 1876.

Estimated numbers: Official census (1957) reported 638 (Anon., 1964). In 1964 Kenyon counted 396 and estimated a total of 500 in California waters. California Department of Fish and Game estimated 1,200 animals in 1969 (M. Odemar pers. communication).

Breeding rate in the wild: One pup per female per year.

Reasons for decline: Slaughtered for furs since latter half of 18th century, and later poaching by Japanese and Russians.

Protective measures already taken: Protected by State law and Marine Mammal Protection Act of 1972.

Measures proposed: Continued protection by California and Federal law. According to Kenyon (personal communication) the sea otter does not range regularly beyond 3-mile limit off the coast of California.

Number in captivity: During 1972 California Fish and Game placed 4 at Sea World, San Diego.

Breeding potential in captivity: Unknown.

Remarks: Together with Alaska subspecies, total catch 1842-62 was about 26,000; 1881-90, total catch was about 48,000. By 1910 the total catch of a fleet of 16 schooners was only 31. Rediscovered off Monterey County, California, 1939, and since have extended south to Pt. Conception and probably the Channel Islands; one found to the north of Santa Cruz County, 1940, and several at Ano Nuevo Island, San Mateo County, 1963.

References:

Allen, G. M. 1942. Extinct and vanishing mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Spec. Publ. 11, pp. 417-424.

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National Wildlife Federation. 1956. Our endangered wildlife. pp. 7-8.
Odemar, M. W. and K. C. Wilson. 1970. Population studies of sea otters in California. California Dept. of Fish and Game, MRR Ref. No. 70-3, Mimeo.
Orr and Poulter. 1964. Northward movement of the California sea otter. California Fish and Game, 50(2): 122-124.

FLORIDA PANTHER — Felis concolor coryi (Bangs)

Order: CARNIVORA — Family: FELIDAE

Distinguishing characteristics: Large (total length up to 7 feet), long-tailed, unspotted cat; upper parts--pale brown, under parts--dull white; tail tip, back of ears, and sides of nose--dark brown or blackish.

Present distribution: Collier, Lee, Levy, Hendry, and Monroe Counties, Florida. One killed (1968) for depredating stock in Citrus County. Sightings recorded in Leon County, 1969; Wakulla County, 1969; and Palm Beach County outside Loxahatchee National Wildlife Refuge on several occasions in 1969. One of the latter sightings was killed. Transient animals sighted at Chassahowitzka, Ding Darling, and Loxahatchee National Wildlife Refuges in 1969. One killed in Ocala National Forest, 1967. Sighted near Clermont, Florida, 1968, and near Lake Talquin, southwest of Tallahassee, 1969. Regularly reported by tourists and Park Service personnel in the Everglades National Park.

Significant new recordings of northern range from northwest Florida; one adult seen by Pat Quinn, zoologist, on Perdido River, the common border of Florida and Alabama, 25 miles north of Pensacola. Larry Johnson of the Florida Game and Fresh Water Fish Commission observed two panthers cross the road at the Yellow River, 5 miles due east of Highway 85, south of Crestview, Florida, Santa Rosa County, in 1969. Additional sightings at Eglin Air Force Base and Cory Field Naval Training Base in northwestern Florida. These areas consist of large, unmolested habitats which support large populations of deer. The most northernly recent sightings of panthers in Georgia were made by qualified observers from University of Georgia on three different occasions. Dr. Ernie Provost of University of Georgia ascribes spread of panthers into Georgia to an increased deer population.

Former distribution: Eastern Texas or western Louisiana, and Lower Mississippi River Valley east throughout the Southeastern United States.

Status: Seriously depleted, although population appears stable since 1966, when first protected by law in Florida.

Estimated numbers: 150 to 300.

Breeding rate in the wild: Unknown.

Reasons for decline: Heavy trapping and hunting pressure; loss of prey and habitat for this wilderness species.

Protective measures already taken: Fully protected by law in Florida. Additional protection in national parks and wildlife refuges--Everglades, Loxahatchee, St. Marks, etc.

Measures proposed: Locate existing populations, and if not on Government-controlled land, purchase areas as refuges for panther. Purchase a few captive Florida panthers and breed them for restocking former ranges taking care to maintain a genetically pure stock in captivity. Conduct ecological studies of panther's habitat needs, food habits, spacing and movements.

Number in captivity: Probably no more than 6 to 10 individuals in private zoos.

Breeding potential in captivity: Believed good.

Remarks: In 1969 two panthers were released from a roadside zoo into Everglades National Park. Shortly thereafter they were killed in orchards near Homestead, Florida. Species is widely distributed from Canada to South America and is not in danger of extinction. Several other subspecies occur in the United States. Few population figures available, but 1,100 to 1,200 estimated in Utah and 600 in California in 1970.

References:

Calahane, V. H. 1964. A preliminary study of distribution and numbers of cougar, grizzly and wolf in North America. Published by New York Zoological Society, Bronx, N.Y.

Eaton, R. L. 1970. Pilot-study on ecology of Florida panther. Unpubl. ms.

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Young, S. P., and E. A. Goldman. 1946. The puma, mysterious American cat. Parts I and II. American Wildlife Institute, Wash., D.C. pp. 358.

EASTERN COUGAR — Felis concolor cougar (Kerr)

Order: CARNIVORA — Family: FELIDAE

Distinguishing characteristics: A large, unspotted, long-tailed cat, with coloration described as: "Body and legs a uniform fulvous or tawny hue...Ears light colored within, blackish behind...Belly pale reddish or reddish-white... Face sometimes with a uniform lighter tint than the general hue of the body." (De Kay, 1842). Goldman (Young and Goldman, 1946) says that it is similar to the Florida cougar (F. c. coryi) but differs in cranial details. He also says that it is similar to F. c. hippolestes of Wyoming, but is smaller, with skull differing in detail.

Present distribution: One specimen taken in New Brunswick in 1932; one taken in Maine in 1938; one in Pennsylvania in 1967 (Wright, 1971). There is some question as to whether the Pennsylvania specimen was an escapee from captivity. In addition to the above, there have been hundreds of sightings reported from eastern Canada to the Carolinas in recent years. Many of these sightings have been by reliable observers (National Park rangers, zoologists, etc.) and have to be given credence. On the basis of his analysis of these reports of sightings, Wright (1971) says: "...the range of the supposedly extinct eastern panther runs across the Laurentians from central Ontario to the Atlantic coast of Cape Breton Island, and between the Mississippi and the Atlantic south to where it merges with the range of F. c. coryi."

Former distribution: Eastern United States and Canada, as far north as Maine, southern Ontario and Quebec; intergrading to the southward with coryi (Young and Goldman, 1946).

Status: Formerly regarded as extinct. Over the vast range where sightings now indicate that the eastern panther may occur, Wright (1971) says: "...its numbers must be the smallest fraction above the limit of survival and its gene pool must be the smallest possible."

Estimated numbers: No reliable estimates available. On the basis of sightings and interviews, Cahalane (1964) indicated there may be about 25 eastern panthers in New Brunswick.

Breeding rate in wild: According to Young and Goldman (1946), the gestation period for the species is 96 days; number of young range from one to six, born at any time of the year. Females breed once every two to three years. Nothing is known about breeding in F. c. cougar, but presumably it does not differ from the species as a whole.

Reasons for decline: Hunted and trapped relentlessly as a "pest" species; elimination of habitat through extensive deforestation; decline in numbers (until comparatively recently) of primary prey species, the white-tailed deer.

Protective measures already taken: Protected by law in New Hampshire since 1967; both North Carolina and Virginia passed laws in 1971 giving the panther complete protection.

Measures proposed: Surveys should be conducted in areas with most reports of sightings to ascertain if panthers actually do occur, and to make estimates of their numbers and distribution. States not now offering protection to panthers should be encouraged to do so.

Number in captivity: None.

Breeding potential in captivity: Based on experience with other races of *F. concolor*, the breeding potential of *F. c. cougar* should be good.

References:

Cahalane, V. H. 1964. A preliminary study of distribution and numbers of cougar, grizzly and wolf in North America. New York Zoological Society, 12 pp.

De Kay, James E. 1842. Zoology of New York, or the New York fauna. Albany, 146 pp.

Young, Stanley P., and Edward A. Goldman 1946. The puma, mysterious American cat. American Wildlife Institute, 358 pp.

Wright, Bruce S. 1971. The recovery of the panther in eastern North America. Paper presented at the International Symposium on the Ecology, Behavior and Conservation of the World's Cats. Laguna Hills, California.

RIBBON SEAL — Histriophoca fasciata (Zimmermann)

Order: PINNIPEDIA — Family: PHOCIDAE

Distinguishing characteristics: Adults attain a length of up to 6 1/2 feet; coloration of male--dark brown marked with well-defined yellowish-white band around the neck, one around base of each forelimb, and one around rump; coloration of female--pale grayish-yellow or grayish-brown, with whitish band across lower back.

Present distribution: In general, from Kurile Islands and Okhotsk Sea northward along the coasts of Kamchatka and in the Bering Straits. Along the Alaska coast, from Point Barrow to the Aleutian Islands.

Former distribution: Roughly the same.

Status: Small population.

Estimated numbers: No estimates.

Breeding rate in the wild: Young are born on the ice in March, April, and early May. Females probably breed once every 2 years.

Reasons for decline: This species has apparently always existed in small numbers; there probably has been no decline in recent years.

Protective measures already taken: None.

Measures proposed: None at present.

Numbers in captivity: Unknown.

Breeding potential in captivity: Unknown.

References:

Allen, G. M. 1942. Extinct and vanishing mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Spec. Publ. 11, pp. 447-449.

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Scheffer, V. B. 1958. Seals, sea lions, and walruses. Stanford Univ. Press, p. 103.

CARIBBEAN MONK SEAL — Monachus tropicalis (Gray)

Order: PINNIPEDIA — Family: PHOCIDAE

Distinguishing characteristics: Size to about 8 feet in total length; uniform brownish-gray above; underparts pale yellow or yellowish white.

Present distribution: Not definitely known; two individuals were seen near Jamaica in 1949, and it was known to occur in Jamaican waters as late as 1952. One was killed in 1922 near Key West, Florida. Inhabited Seranilla Bank in the western Caribean until at least 1952.

Former distribution: Shores and islands of the Caribbean Sea and Gulf of Mexico, from Honduras eastward to Jamaica, Cuba, Florida Keys and the Bahamas. (Reports from Texas are unauthenticated.)

Status: Either in extremely small numbers or extinct.

Estimated numbers: No estimate available.

Breeding rate in the wild: One pup, perhaps only in alternate years.

Reasons for decline: This seal is apparently sluggish, unsuspicious, and not easily alarmed, allowing it to be readily approached and easily killed. It has been indiscriminately slain since early Spanish days.

Protective measures already taken: None.

Measures proposed: A thorough aerial survey should be made of the Caribbean area to determine if any still exist. If so, rigid international protective agreements should be proposed. Establishment of a breeding colony at the Dry Tortugas (Fort Jefferson National Monument) has been suggested.

Number in captivity: None.

Breeding potential in captivity: Unknown.

Remarks: If not already extinct, this species is so decimated in numbers that there is little hope for its continued survival.

References:

Allen, G. M. 1942. 452-455.

Burt, W. H. 1971. Antarctic Pinnipedia. Part of Antarctic Research Series, Vol. 18, Publ. by American Geophysical Union.

Elliot. 1904. 542-543.

Gilmore, R. 1959. Is the West Indian seal extinct? Sea Frontiers, 5(4): 225-236.

Gunter, G. 1947. Some records of the West Indian seal Monachus tropicalis (Gray), from the Texas coast. Jour. Mamm., 28(3): 289-290.

Scheffer. 1958. 113-114.

HAWAIIAN MONK SEAL — Monachus schauinslandi (Matschie)

Order: PINNIPEDIA — Family: PHOCIDAE

Distinguishing characteristics: Similar to the Caribbean monk seal, but differs in several cranial characters; coloration dark brown above, sides paler, and belly white or yellowish. Female may attain a total length of about 7½ feet and an estimated weight of 600 pounds; males somewhat smaller.

Present distribution: Hawaiian archipelago, primarily the small northwestern islands most of which lie within the Hawaiian Islands National Wildlife Refuge. Observed occasionally off main inhabited islands. Rare stragglers seen recently at Johnston Atoll.

Former distribution: The same except may not have occurred on Johnston.

Status: Not immediately threatened as long as national refuge remains inviolate from unauthorized landings by fishermen and other mariners. Does not thrive on islands where there is a human population. Beginning to reappear on Midway in very low numbers where two decades ago it was common. Small population on Kure Atoll. Predation by sharks, especially on weaned pups, may be limiting populations.

Estimated numbers: About 1,000.

Breeding rate in the wild: Single pup per female probably in alternate years. Breeding season, usually February through June. Solitary. Most important pupping areas are on national refuge (French Frigate Shools, Laysan and Lisianski Islands and Pearl and Hermes Reef). Some at Kure and, a few at Midway.

Reasons for decline: Extreme exploitation in mid-19th century and almost exterminated. Continual harassment at Midway in past.

Protective measures already taken: Establishment of Hawaiian Islands National Wildlife Refuge in 1909. Increased patrol of refuge. Entry on refuge by permit only. Information about prohibition of unauthorized entry included on official charts of archipelago and U.S. Coast Pilot used by mariners. Protected by Federal and State law. Protected on Kure and now by Navy at Midway. Life history research on refuge in progress. Publicity on status of species and refuge.

Measures proposed: Continued stringent protection on refuge, Kure and Midway. Continue research on refuge and publicity on status.

Number in captivity: One at Honolulu Aquarium.

Breeding potential in captivity: Unknown.

References:

Bureau of Sport Fisheries and Wildlife Administrative Reports.

Hawaii Division of Fish and Game Administrative Reports.

Kenyon, K. and D. W. Rice. 1959. "Life History of the Hawaiian Monk Seal," Pacific Science, July.

King, J. E. 1964. "The Monk Seal of the Pacific." Zeitschs. Sauqetierk, 29(1): 37-42.

Rice, D. W. 1960. "Population dynamics of the Hawaiian Monk Seal," Jour. Mamm., 41(3): 376-385.

GUADALUPE FUR SEAL — Arctocephalus philippi townsendi (Merriam)

Order: PINNIPEDIA — Family: OTARIIDAE

Distinguishing characteristics: A small eared seal similar to the northern fur seal, but snout long and pointed, described as "collie-like," and adult bulls much smaller. Color--blackish-gray.

Present distribution: Guadalupe Island, Mexico, with occasional records from other islands (one on San Nicolas Island, 1949; three at Cedros Island, 1965).

Former distribution: Islands off northern Baja California south to Cedros Island, the Channel Islands of southern California, and perhaps on the Farallon Islands off San Francisco.

Status: Occurs in small numbers; slowly increasing population in recent years.

Estimated numbers: About 1,000 individuals, January 1970; up from 600 in 1965.

Breeding rate in the wild: One pup per female per year.

Reasons for decline: No recent decline.

Protective measures already taken: Protected by the Mexican Government, although permission to capture for zoos occasionally granted. Protected in general, like sea lions, along California coast. Classed as rare and protected under California Fish and Game Code.

Measures proposed: Acquisition and careful patrol by the Federal Government of islands or parts of islands containing sea caves along the California coast.

Number in captivity: Three in San Diego Zoo and two in Mexico City Zoo during past three years (1966).

Breeding potential in captivity: None.

Remarks: This species was probably one of the least common mammals in North America. For some years it was believed to be extinct. Sealing in the 1800's brought about its great reduction in numbers.

References:

Bartholomew, G. A., Jr. 1950. A male Guadalupe fur seal on San Nicolas Island, California. Jour. Mamm., 31:175-180.

_____. 1952. Winter population of Pinnipedia about Guadalupe, San Benito, and Cedros Islands, Baja California. Jour. Mamm., 33:160-171.

Hubbs, C. L. 1956. The Guadalupe fur seal still lives. Zoonooz, 29, No. 12: 6-9.

_____. 1956. Back from oblivion. Pacific Discovery, 9(6):14-21.

Peterson, R. S., C. L. Hubbs, R. L. Gentry, and R. L. DeLong. 1968. The Guadalupe fur seal; habitat, behavior, population size, and field identification. Jour. Mamm. 49(4), pp. 665-675.

Rice, D. W., K. W. Kenyon, and D. B. Lluch. 1965. Pinniped populations at Islas Guadalupe, San Benito, and Cedros, Baja California, in 1965. Trans. of San Diego Society of Natural History, 14(7), pp. 73-84.

Scheffer, V. B. 1958. Seals, sea lions, and walruses. Stanford Univ. Press, pp. 78-82.

FLORIDA MANATEE or FLORIDA SEA COW — Trichechus manatus latirostris (Harlan)

Order: SIRENIA — Family: TRICHECHIDAE

Distinguishing characteristics: Large (1,000 pounds) aquatic mammal, hindlimbs absent; forelimbs modified as flippers; tail a rounded fluke.

Present distribution: Coastal areas of Florida; found along the edges of Everglades National Park and at least occasionally throughout the Florida Keys. They persist (in small numbers) in such heavily used boating areas of southeastern Florida as Biscayne Bay, Miami River, and New River and occur northward as far as the St. Johns River, Jacksonville.

Former distribution: Coastal waters and lagoons, North Carolina to southern Texas.

Status: Range greatly reduced.

Estimated numbers: No reliable estimate. According to Craig Phillips (personal communication), the manatee may actually be more abundant than is believed at present, due to the fact that it is one of the most difficult of all totally aquatic mammals to observe in the wild. It is, however, considered herein to be of special concern because of the lack of reliable estimates as to its numbers in Florida and because of its greatly reduced range. Five manatees resident at the Chassahowitzka National Wildlife Refuge, 5 at the J. N. "Ding" Darling National Wildlife Refuge, and 15 at the Merritt Island National Wildlife Refuge in 1969.

Breeding rate in the wild: A single calf per cow; no sure data as to gestation period or frequency of breeding.

Reasons for decline: There is no evidence of recent decline (1966). They declined in the past for the following reasons: Hunting for flesh, oil, and skins; wanton slaughter for "sport;" silting of coastal feeding grounds; freezing weather inducing pneumonia; crocodiles and sharks, possibly taking a few very young animals; injuries received from keels and propellers of powerboats.

Protective measures already taken: Legal protection throughout Florida. Everglades National Park--the largest sanctuary for manatee in the country. Also occur at Chassahowitzka, J. N. "Ding" Darling, and Merritt Island National Wildlife Refuges.

Measures proposed: Continue legal protection; establish sanctuary areas; impound certain areas and experimentally stock.

Number in captivity: 1 animal at South Florida Museum, Bradenton, Fla.; 1 at Marineland, St. Augustine, Fla.; 1 at Albany City Zoo, Albany, Ga.; 1 male and 1 female in Miami Seaquarium (Pers. Comm., 1971, USGMA Cole). They have been successfully maintained at a number of larger zoos.

Breeding potential in captivity: Unknown.

Remarks: The typical race (manatu) persists in the West Indies and along the coasts of central and northern South America. Recent discovery of its usefulness in controlling aquatic vegetation in canals and irrigation ditches may encourage its protection.

References:

Allen, G. M. 1942. Extinct and vanishing mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Spec. Publ. 11, pp. 538-547.

Anonymous. 1964. Manatee for weed control. Florida Wildlife, 18(3), pp. 29-30.

Beard, D. B. 1942. Fading trails: The story of endangered American wildlife. Macmillan, N.Y., pp. 88-97.

Garfield, G. 1964. Nature's living herbicide. Outdoor America, 29(11):9.

Matthiessen, P. 1959. Wildlife in America. Viking, N.Y., pp. 40-41.

Moore, J. C. 1951. The status of the manatee in the Everglades National Park, with notes on its natural history. Jour. Mamm., 32(1):22-36.

_____. 1951. The range of the Florida manatee. Quarterly Jour. Florida Academy of Sciences. 14(1):1-19.

_____. 1953. Distribution of marine mammals to Florida waters. American Midland Naturalist, 49(1):117-158.

Palmer, R.S. 1954. The mammal guide; Mammals of North American north of Mexico. Doubleday, Garden City, N.Y., pp. 323-325.

TULE ELK OR DWARF ELK — Cervus nannodes (Merriam)

Order: ARTIODACTYLA — Family: CERVIDAE

Distinguishing characteristics: Slightly smaller, paler, and with more narrow rump-patch than Rocky Mountain elk.

Present distribution: Three major, well-separated populations in California. Two of these--one in the Cache Creek area (Colusa, Lake, and Yolo Counties) and one in Owens Valley (Inyo County)--are free-roaming. The third herd is fenced in the Tule Elk State Park near Tupman (Kern County). Five main herds in the Owens Valley.

Former distribution: Common prior to 1860 in nearly the entire San Joaquin and Sacramento Valleys, California (Butte to Kern Counties); restricted to the Buttonwillow Ranch, western Kern County, by 1905; total in 1932, 170.

Status: The herd in the Cache Creek area has remained fairly stable. The Owens Valley population regularly increases beyond the capacity of its habitat.

Estimated numbers: In 1970, the California Fish and Game Department maintained the Owens Valley herds at between 250 and 300 animals and about 140 in the Cache Creek area, Yolo County. Game Department's (1971) policy set 490 elk for Inyo County's 5 herds.

Breeding rate in the wild: One (rarely two) calves per cow annually. Gestation period approximately 250 days.

Reasons for decline: Hunted for meat and hides during Gold Rush of mid 1800's; total population about 28 in 1885. Encroachment of civilization and cultivation have reduced available range, and cattlemen and farmers claim competition with stock and damage to crops and fences.

Protective measures already taken: Herds are carefully managed and protected from indiscriminate hunting by State law. Establishment of Tule Elk State Park. Organization of the Committee for the Preservation of the Tule Elk, dedicated to the protection of this species. Livestock grazing on portion of Inyo National Forest used by Goodale segment of Owens Valley herd restricted since 1965. Five tule elk from Tupman herd transplanted to Whitney area in January, 1972 to establish new herd. State law prohibits hunting tule elk until numbers reach 2,000. Inter-agency committee formed to evaluate proposed transplant sites.

Measures proposed: The Committee for the Preservation of the Tule Elk is attempting to set aside 240 square miles in Owens Valley (owned by the city of Los Angeles, but leased to cattlemen) as a refuge. Initiate studies to determine the optimum numbers of elk that a given habitat can support. Transplant planned for San Luis National Wildlife Refuge in San Joaquin Valley.

Number in captivity: In semi-domestic state, in 1970, are 45 on the Tule Elk Reserve, Kern County; California Fish and Game Department considers 32 optimum. In addition, 35 were in three American zoos and 2 in Germany in 1972.

Breeding potential in captivity: Good.

Remarks: Transplants to Sequoia National Park (1904), Yosemite Valley, and Monterey County in California and to the Alvord Ranch, Harney County, Oregon, were abandoned because of low calving percentages. Transplant to Owens Valley (1933) succeeded. Today supplemental feeding of hay pellets is necessary on the Tule Elk Reserve, and 10 or 15 elk are shot yearly or given to zoological parks to guard against overpopulation; since 1943, in the Owens Valley, legal hunting has cropped the surplus over 300, regarded as the maximum the range can support. The Cache Creek herd, while low in numbers, periodically causes depredation on several large ranches within its range.

References:

Allen, G. M. 1942. Extinct and vanishing mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Spec. Publ. 11, pp. 273-275.

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Forest Service, U.S. Department of Agriculture. 1966. Wildlife habitat management plan for the Inyo National Forest.

Hall, E. R., and K. R. Kelson. 1959. The mammals of North America. Ronald Press, N.Y., Vol. 2, p. 1003.

McCullough, D. R. 1971. The tule elk. Univ. of Calif. Press.

Rintoul, W. T. 1964. Last of the ghost herd. Westways, 56(1): 8-9.

KEY DEER — Odocoileus virginianus clavium (Barbour and Allen)

Order: ARTIODACTYLA — Family: CERVIDAE

Distinguishing characteristics: Smallest of the white-tailed deer, under 110 pounds, 29 inches at shoulder, small antlers; color--pale.

Present distribution: Little Pine Key to Cudjoe Key, Monroe County, Florida.

Former distribution: Most of the southern Florida Keys; readily swims between them.

Status: Very small range and numbers of animals, but slowly increasing.

Estimated numbers: About 300 in 1964; about 600 in 1972.

Breeding rate in the wild: 1 or 2 fawns per doe annually.

Reasons for decline: Development and occupation of islands by man; disastrous effects of hurricanes and fires; overhunting with dogs and jacklights. About 9 per year killed by motor vehicles (52 killed on highway during first 10 months of 1971). Hunting has now been effectively controlled; habitat destruction and road kills are the most critical problems.

Protective measures already taken: National Key Deer Refuge (established in 1963) consists of about 7,321 acres, of which 3,586 are federally owned and 3,735 were leased as of November 1970. Land acquisition is essentially complete.

Measures proposed: Protection of habitat from fire or destruction. Continued legal protection with patrols. Allow reliable individuals and zoos to obtain animals for breeding in captivity.

Number in captivity: Unknown.

Breeding potential in captivity: Based on breeding results of other white-tailed deer in captivity, the breeding potential of the Key deer should be very good.

Remarks: In 1949 population was down to about 30 deer. With present protection continued, the Key deer's survival seems promising.

References:

Allen, G. M. 1942. Extinct and vanishing mammals of the Western Hemisphere. American Committee for International Wildlife Protection, Spec. Publ. 11, p. 288.

Klimstra, W. D., J. Hardin and N. Silva. 1969. Key Ddeer investigations, Annual Report 1968-1969. Cooperative Wildlife Research Laboratory, Southern Illinois University, Carbondale, Illinois. September 30, 1969.

Matthiessen, P. 1959. Wildlife in America. Viking, N.Y., pp. 65-67.

National Wildlife Federation. 1956. Our endangered wildlife, pp. 11-12.

COLUMBIAN WHITE-TAILED DEER — Odocoileus virginianus leucurus (Douglas)

Order: ARTIODACTYLA — Family: CERVIDAE

Distinguishing characteristics: A medium-size, white-tailed deer with small, erect antlers and long tail.

Present distribution: Remnant populations in Columbia River lowlands and on islands near Skamokawa, Washington, and Clatskanie, Oregon. A few left near Roseburg, Oregon; believed to be genetically impure from inbreeding with the black-tailed deer.

Former distribution: All lower Columbia, Willamette, and Cowlitz River bottoms.

Status: Seriously depleted.

Estimated numbers: About 100 in Oregon along the Columbia River; about 150-200 in Washington in 1971.

Breeding rate in the wild: Normal white-tail production.

Reasons for decline: Loss of habitat. Bottom lands being cleared for intensified agriculture and industry.

Protective measures already taken: Areas in which Columbian white-tailed deer occur, along Columbia River, closed to deer hunting in 1970-71 by States of Washington and Oregon. National Wildlife Refuge established in 1972 in key habitat along Columbian River for the purpose of preserving and restoring habitat.

Measures proposed: Complete acquisition of lands for the National Wildlife Refuge described above. Determine if reintroduction of the deer to selected formerly occupied habitats is feasible, and if so proceed with it.

Number in captivity: None.

Breeding potential in captivity: Possible.

Remarks: The Columbian white-tailed deer has been isolated from other races of white-tailed deer by both its geographical range and special habitat adaptions. It is now jeopardized by habitat destruction. Its future is in jeopardy throughout its limited range.

References:

Cowan, I. 1936. Distribution and variation in deer of the Pacific Coastal Region of North America. Calif. Fish and Game, Vol. 22, No. 3.

Scheffer, V. B. 1940. A newly located herd of Pacific white-tailed deer. Jour. Mamm., Vol. 21, No. 3.

See Lewis and Clark's Journals for early distribution of this deer.

SONORAN PRONGHORN — *Antilocapra americana sonoriensis* (Goldman)

Order: ARTIODACTYLA — Family: ANTILOCAPRIDAE

Distinguishing characteristics: A small, pale pronghorn, similar to the Mexican pronghorn (*A. a. mexicana*), but considerably smaller and differing in cranial details. Smaller and paler than either *A. a. americana* and *A. a. peninsularis*.

Present distribution: Found in the United States only in a limited portion of the Cabeza Prieta Game Range and the Organ Pipe Cactus National Monument, Arizona. Present Mexican range is unknown, but believed to be confined to northwest Sonora from about 100 miles northwest of Hermosillo north to the Pinacate region.

Former distribution: Desert plains of central western Sonora and north to southern Arizona.

Status: Reduced in range and numbers; possibly holding its own in Arizona, but probably rapidly decreasing in Sonora.

Estimated numbers: In 1968, about 60 on the Cabeza Prieta Game Range and 15 on Organ Pipe Cactus Monument. According to Bernardo Villa R., following a survey in 1957, about 1,000 were then left in Mexico.

Breeding rate in the wild: Usually 1 kid per doe annually; sometimes 2.

Reasons for decline: Competition from domestic cattle and horses. Overshooting and poaching, especially in Mexico in recent years. Predation on its reduced numbers.

Protective measures already taken: Establishment of Cabeza Prieta Game Range and Organ Pipe Cactus National Monument. Mexican Government is taking protective measures.

Measures proposed: Establishment of an international game range. Research into the animal's ecologic needs.

Number in captivity: None.

Breeding potential in captivity: Probably fair.

Remarks: Small numbers on American side are dependent for survival on the existence of a larger nucleus on the Mexican side; in some years, none are found on the American side. This makes it a mammal of international interest, and its management must depend on international cooperation.

References:

Narrative reports of the Cabeza Prieta Game Range (Bureau of Sport Fisheries and Wildlife files), 1939--present.

Goldman, E. A. 1945. A new pronghorn antelope from Sonora. Proc. Biol. Soc., Washington, Vol. 58, p. 3.

Villa R., Bernardo. 1958. Informal report on studies of bighorns and antelope in northern Mexico. Instituto de Biologia, Mexico, D.F.

CALIFORNIA BIGHORN — Ovis canadensis californiana (Douglas)

Order: ARTIODACTYLA — Family: BOVIDAE

Distinguishing characteristics: Similar in size to the Rocky Mountain bighorn (Ovis c. canadensis) but differs in being somewhat darker in coloration and in having the horns smaller and more slender, the tips not usually being blunted as severely as in canadensis.

Present distribution: In the United States, free roaming populations apparently confined to eastern Oregon and the high Sierra Nevada of California. The maincrest of the mountains and lateral ridges running west are occupied in the summer months and the lower east-facing slopes during the winter. In Canada, there are herds in southern British Columbia, some of which may migrate into Washington during the summer.

Former distribution: From Chilcotin River, British Columbia, south through Cascades of Washington and Oregon and Sierra Nevada of California to vicinity of Mount Whitney; and western Nevada south probably to Mineral County.

Status: Jones (1950) concluded that the trend in population in the Sierra Nevada was upward. Declared rare by California Fish and Game Commission.

Estimated numbers: Less than 200 in California; 1,200 in British Columbia (Buechner, 1960: 73); 250 in Oregon; 18 in Nevada.

Breeding rate in the wild: One (occas. 2) lambs per ewe annually.

Reasons for decline: Indiscriminate hunting and scabies, presumably contracted from domestic sheep, were evidently the principal causes for decline. Possibly direct competition with domestic livestock for adequate range predisposed the bighorn sheep population to disease.

Protective measures already taken: The California bighorn is fully protected by State law in California. In addition, an effort is underway to establish permanent natural populations of the subspecies in Washington with animals imported from British Columbia. Transplants to Hart Mountain Antelope Refuge and Steens Mountain, Oregon successful. Transplants to Sheldon Antelope Range, Nevada, and to Lava Beds National Monument, California recently made. In key bighorn sheep areas in California the U.S. Forest Service and National Park Service have restricted human use. In Sierra Nevada Range a 41,000 acre zoological area to protect two herds established on Inyo National Forest.

Measures proposed: Continue efforts to introduce animals into areas from which they were extirpated; attempt to improve forage conditions through reduction of competing domestic livestock, elk, and deer.

Number in captivity: Not known. Total of 30 in enclosures at Lava Beds National Monument and Sheldon Antelope Range.

Breeding potential in captivity: Good.

References:

Buechner, H. K. 1960. The bighorn sheep in the United States. Wildlife Monogr. No. 4:1-174.

Dunaway, D. S. 1971. Bighorn sheep habitat management on Inyo National Forest, a new approach. Desert Bighorn Council Transactions, Vol. 15, p. 18-23.

_____. 1971. Human disturbance as a limiting factor of Sierra Nevada bighorn sheep. Transactions North American Wildsheep Conference, Vol 1, p. 165-173.

Jones, F. L. 1950. A survey of the Sierra Nevada bighorn. Sierra Club Bulletin, 35(6):29-76.

Jorgensen, P. D. and D. B. Schaup. 1972. California bighorn sheep survey--Mt. Langley Herd Unit. Dept. of Fish and Game Report. Mimo.

Leach, H. R. and L. O. Fisk. 1972. At the crossroads--A report on California's Endangered and Rare Fish and Wildlife. Calif. Dept. of Fish & Game.

Weaver, R. A. 1972. California bighorn in the Sierra Nevada Mountain Range. Calif. Dept. of Fish & Game, Wildlife Management Administrative Report No. 72-7.

_____. 1972. Conclusion of bighorn investigations in California. Desert Bighorn Council Transactions Vol. 16, inprint.

Welles, R. E. and F. B. 1961. The bighorn of Death Valley. Fauna Series No. 6, Fauna of the National Parks of the United States.

PENINSULAR BIGHORN — Ovis canadensis cremnobates (Elliot)

Order: ARTIODACTYLA — Family: BOVIDAE

Distinguishing characteristics: A small, desert-inhabiting, bighorn sheep, similar to the Nelson bighorn, but even paler in coloration; horns in males, and over-all size of males and females, larger than Nelson bighorn.

Present distribution: Santa Rosa Mountains and other parts of extreme southern California, south into northern Baja California, Mexico.

Former distribution: Same.

Status: Buechner (1960:64) says that the race seems secure in the mountains of southwestern California, including the Santa Rosa Mountains. However, it is now known some habitat in private ownership may be developed as home sites.

Estimated numbers: 971 estimated by California Department of Fish and Game in 1971.

Breeding rate in the wild: One (occasionally 2) lambs per ewe annually. Lamb mortality is around 90 percent.

Reasons for decline: Heavy hunting pressure, particularly in Baja California despite the decree of total closed season that has existed there for over 40 years, plus drought.

Protective measures already taken: Taking and possession prohibited by California law in Baja California.

Measures proposed: Strict enforcement of game laws in Baja California to reduce poaching pressure. Buechner (1960:64) states: "The entire peninsula area ought to be studied carefully to determine the distribution of bighorn sheep and the magnitude of the poaching problem before herds become further decimated as human populations increase."

Number in captivity: Unknown. One male at University of California at Riverside Deep Canyon Research Center.

Breeding potential in captivity: Good.

Remarks: This subspecies intergrades with the desert bighorn, Ovis c. nelsoni, in extreme southern California, and it is often impossible to assign individual specimens from that area to either subspecies.

References:

Buechner, H. K. 1960. The bighorn sheep in the United States. Wildlife Monogr. No. 4:1-174.

Menez, A. Z. 1961. Present conditions of the bighorn mountain sheep in the State of Baja California, Mexico. Fifth Annual Meeting, Desert Bighorn Council, April 4-7, 1961, Hermosillo, Sonora, Mexico, pp. 13-16.

Russo, J. P. 1960. The desert bighorn sheep in Arizona. Wildlife Bull. No. 1, Ariz. Game & Fish Dept., 153 pp.

Wauer, R. H. 1964. The unpredictable Nelson bighorn. National Parks Mag., 38:10-11.

Weaver, R. A. 1972. Conclusion of bighorn investigations in California. Desert Bighorn Council Transactions, Vol. 16.

_____ and J. L. Mensch. 1970. Bighorn study in Southern Riverside County. Calif. Dept. Fish & Game, Wildlife Management Administrative Report No. 70-5.

_____, J. L. Mensch and W. V. Felt. 1968. A survey of desert bighorn in San Diego County. Calif. Dept. of Fish & Game Office Report.

PERIPHERAL MAMMALS

A peripheral species or subspecies is one whose occurrence in the United States is at the edge of its natural range and which is threatened with extinction within the United States although not in its range as a whole. Special attention is necessary to assure retention in our Nation's fauna.

Coatimundi or Chula, Nasua narica molaris
Southern Arizona, New Mexico, and Texas. Subject to epidemics and periodic fluctuations in population.

Jaguar, Felis onca veraecrucis
Eastern and southeastern Mexico north to central Texas.

Jaguarundi, Felis yagouaroundi cacomitli
Tampico, Tamaulipas, Mexico, north to extreme southern Texas. Reported seen at Platt National Park in Oklahoma.

Ocelot, Felis pardalis albescens
Northeastern Mexico into northern Texas.

Margay, Felis wiedii cooperi
Northeastern Mexico into southeastern Texas.

Woodland caribou, Rangifer tarandus caribou
Northern Great Lakes States to Hudson Bay, Canada.

Mountain caribou, Rangifer tarandus montanus
Pacific Northwest, United States, to British Columbia, Canada. A transient group of 25 to 100 in extreme northern Idaho and Washington.

STATUS-UNDETERMINED MAMMALS

A status-undetermined species or subspecies is one that has been suggested as possibly threatened with extinction, but about which there is not enough information to determine its status. More information is needed.

Arizona prairie dog, Cynomys ludovicianus arizonensis (Mearns)
Southeastern Arizona, southern and central New Mexico, southwestern Texas.

Chiricahua squirrel, Sciurus nayaritensis chiricahuae (Goldman)
Chiricahua Mountains of southeast Arizona.

Apache fox squirrel, Sciurus nayaritensis
Chiricahua Mountains of southeast Arizona and adjacent areas in Mexico.

Eastern fox squirrel, Sciurus niger vulpinus
Southern Pennsylvania, eastern West Virginia, northern Virginia, and Maryland exclusive of the Eastern Shore.

Texas kangaroo rat, Dipodomys elator
North-central Texas and southwestern Oklahoma.

Big-eared kangaroo rat, Dipodomys elephantinus
Central California.

Guadalupe mountain vole, Microtus mexicanus guadalupensis
El Paso County, Texas, and Sacramento Mountains, New Mexico.

Louisiana vole, Microtus ludovicianus
Southeastern Texas and southwestern Louisiana.

Florida water rat or round-tailed muskrat, Neofiber alleni
Bogs and marshes of Florida and extreme southern Georgia.

Northern swift fox, Vulpes velox hebes
North Dakota, South Dakota, eastern Montana, Wyoming, and adjacent areas in Canada. One taken in North Dakota in 1970--first since 1915.

Polar bear, Thalarctos maritimus
Circumpolar; in Western Hemisphere, northern Alaska, Canada, and Greenland. International research program is underway to determine status.

Pine marten, Martes americana
Alaska and Northern United States, south in mountains to central California and northern New Mexico. Reintroduced in Wisconsin, Michigan, and New Hampshire. Protected by law in Michigan.

Sierra red fox, Vulpes fulva necator
Sierra Nevada Mountains, California.

Fisher, Martes pennanti

Northern United States. Reintroduced in Idaho, Oregon, Michigan, West Virginia, and Wisconsin. Increasing in recent years in Massachusetts, New Hampshire, and northern New York. Protected by law in Michigan and Washington.

Everglades mink, Mustela vison evergladensis

Mangrove and cypress swamps of Florid Everglades and the Ten Thousand Islands.

Wolverine, Gulo luscus

Alaska and northern United States, south in mountains to central California, Utah, and Colorado. Rare in Idaho. Completely protected in California, Colorado, and Washington. Increasing in Washington.

Canada lynx, Lynx canadensis

Alaska, Canada, and Northern States. Rare in Idaho; making a comeback in northern Michigan; protected in Wisconsin and Michigan; still carries a $20 bounty in New Hampshire. About 300 in Washington. About 10 taken per year by trappers in Washington.

Elephant seal, Mirounga angustirostris

Alaska southward to Baja California, Mexico; breeding from Ano Nuevo Island, California, southward.

Appendix A

Office of Endangered Species and International Activities and Regional addresses, Bureau of Sport Fisheries and Wildlife.

Pertinent Addresses--The conservation of Endangered Species requires a high degree of cooperation and communication between interested persons and agencies. Moving the right information to the right person at the right time may be all that is needed to prevent the loss of an endangered species or to keep an animal from becoming endangered. The following is provided to facilitate the flow of such information.

Bureau of Sport Fisheries and Wildlife--This unit of the U. S. Department of the Interior has been delegated the responsibility for coordinating national efforts on behalf of Endangered Species.

Washington, D.C.--Inquiries should be addressed to:

Office of Endangered Species and International Activities
Bureau of Sport Fisheries and Wildlife
U.S. Department of the Interior
Washington, D.C. 20240
Telephone: 202/343-5687

Regional--The Bureau of Sport Fisheries and Wildlife is comprised of six Regional Offices and an Alaska Area Office.

Each of these offices has a senior official who has been designated as a Regional Endangered Species Coordinator. Problems of a local or regional nature should be referred to these offices.

1. Alaska Area Director
   Bureau of Sport Fisheries and Wildlife
   813 D Street
   Anchorage, Alaska 99501
   Telephone: 907/265-4864

1. Regional Director
   Bureau of Sport Fisheries and Wildlife
   1500 Northeast Irving Avenue
   P. O. Box 3737
   Portland, Oregon 97208
   Telephone: 503/234-3361

2. Regional Director
   Bureau of Sport Fisheries and Wildlife
   Federal Building
   U. S. Post Office and Courthouse
   500 Gold Avenue, S.W.
   Albuquerque, New Mexico 87103
   Telephone: 505/843-2321

3. Regional Director
   Bureau of Sport Fisheries and Wildlife
   Federal Building, Fort Snelling
   Twin Cities, Minnesota 55111
   Telephone: 612/725-3500

4. Regional Director
   Bureau of Sport Fisheries and Wildlife
   Peachtree-Seventh Building
   Atlanta, Georgia 30323
   Telephone: 404/526-5100

5. Regional Director
   Bureau of Sport Fisheries and Wildlife
   U. S. Post Office and Courthouse
   Boston, Massachusetts 02109
   Telephone: 617/223-2961

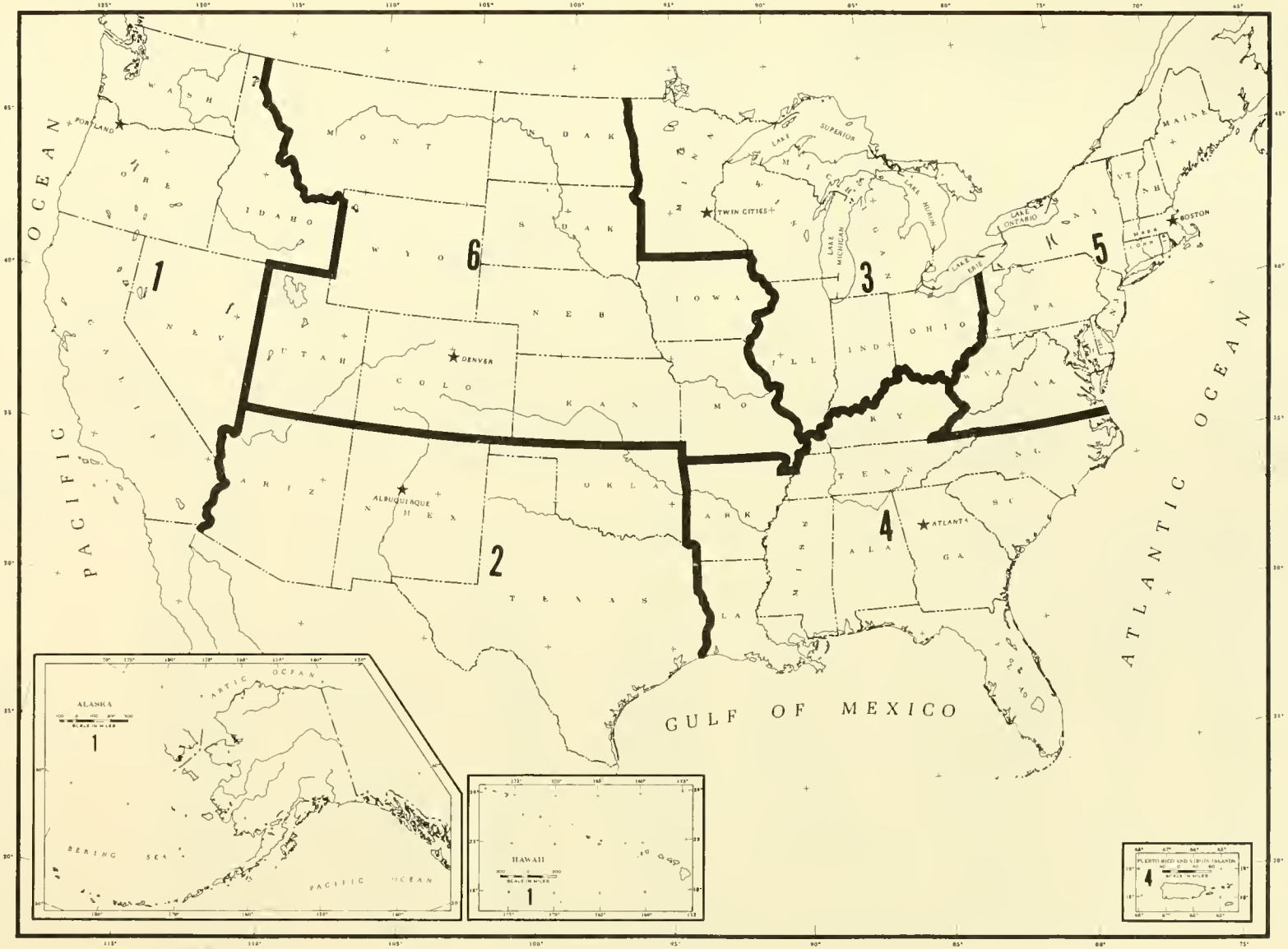
6. Regional Director
   Bureau of Sport Fisheries and Wildlife
   10597 West Sixth Avenue
   Denver, Colorado 80215
   Telephone: 303/234-2209

The geographic area covered by each region is outlined on the following map.

UNITED STATES
DEPARTMENT OF THE INTERIOR

REGIONAL BOUNDARIES

FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE



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WASHINGTON, D.C. JANUARY 1, 1973

SCALE IN MILES

REGIONAL BOUNDARIES

★ REGIONAL OFFICE

State Conservation Agency addresses; list of native endangered species by States.

The various State natural resource agencies play a vital role in the conservation of endangered species. Problems of a local or State nature should be referred to these agencies.

STATE FISH AND GAME ADDRESSES

Commissioner
Department of Conservation
and Natural Resources
64 North Union Street
Montgomery, Alabama 36104
(A.C. 205-269-7221)

Commissioner
Department of Fish and Game
Subport Building
Juneau, Alaska 99801
(A.C. 907- 586-3392)

Director
Game and Fish Department
2222 West Greenway Road
Phoenix, Arizona 85023
(A.C. 602-942-3000)

Director
Game and Fish Commission
Little Rock, Arkansas 72201
(A.C. 501-371-1145)

Director
Department of Fish and Game
1416 Ninth Street
Sacramento, California 95814
(A.C. 916-445-3531)

Director,
Division of Game, Fish and Parks
6060 Broadway
Denver, Colorado 80216
(A.C. 303-825-3356)

Director
Board of Fisheries and Game
State Office Building
Hartford, Connecticut 06115
(A.C. 203-566-3356)

Secretary
Department of Natural Resources and
Environmental Control
P.O. Box 457
Dover, Delaware 19901
(A.C. 302-678-4403)

Director
Game and Fresh Water Fish Commission
Trinity-Washington Bldg., 7th Floor
Atlanta, Georgia 30334
(A.C. 404-656-3500)

Director
Division of Fish and Game
Department of Land and Natural Resources
530 South Hotel Street
Honolulu, Hawaii 96813
(A.C. 808-548-4000)

Director
Fish and Game Department
600 South Walnut Street
P.O. Box 25
Boise, Idaho 83707
(A.C. 208-344-8471)

Director
Department of Conservation
State Office Building
400 South Spring Street
Springfield, Illinois 62706
(A.C. 217-525-6302)

Director
Department of Natural Resources
608 State Office Building
Indianapolis, Indiana 46204
(A.C. 317-633-6344)

Director
State Conservation Commission
State Office Building
300 - 4th Street
Des Moines, Iowa 50319
(A.C. 515-281-5384)

Director
Forestry, Fish and Game Commission
Box F
Pratt, Kansas 67124
(A.C. 316-472-4474)

Commissioner
Department of Fish and Wildlife Resources
State Office Building Annex
Frankfort, Kentucky 40601
(A.C. 502-564-3400)

Director
Wild Life and Fisheries Commission
400 Royal Street
New Orleans, Louisiana 70130
(A.C. 504-527-5126)

Commissioner
Department of Inland Fisheries and Game
State Office Building
Augusta, Maine 04330
(A.C. 207-289-3371)

Director
Fish and Wildlife Administration
State Office Building
P.O. Box 231
Annapolis, Maryland 21401
(A.C. 301-267-5033)

Director
Division of Fisheries and Game
100 Cambridge Street
Boston, Massachusetts 02202
(A.C. 617-727-3151)

Director
Department of Natural Resources
Stevens T. Mason Building
Lansing, Michigan 48926
(A.C. 517-373-1220)

Commissioner
Department of Natural Resources
Centennial Office Building
658 Cedar Street
St. Paul, Minnesota 55101
(A.C. 612-221-2549)

Executive Director
Game and Fish Commission
Game and Fish Building
402 High Street
Jackson, Mississippi 39205
(A.C. 601-354-7333)

Director
Department of Conservation
P.O. Box 180
Jefferson City, Missouri 65101
(A.C. 314-893-2626)

Director
Department of Fish and Game
Mitchell Building
Helena, Montana 59601
(A.C. 406-449-3186)

Director
Game and Parks Commission
State Capitol Building
Lincoln, Nebraska 68509
(A.C. 402-434-0641)

Director
Department of Fish and Game
Box 10678
Reno, Nevada 89510
(A.C. 702-784-6214)

Director
Fish and Game Department
34 Bridge Street
Concord, New Hampshire 03301
(A.C. 603-271-3421)

Director
Division of Fish, and Game, and
Shellfisheries
Department of Environmental Protection
P.O. Box 1809
Labor and Industry Building
Trenton, New Jersey 08625
(A.C. 609-292-2965)

Director
Department of Game and Fish
State Capitol
Santa Fe, New Mexico 87501
(A.C. 505-827-2651)

Director
Division of Fish and Wildlife
Conservation Department Building
State Office Building Campus
50 Wolf Road
Albany, New York 12201
(A.C. 518-457-5690)

Commissioner
Department of Environmental Conservation
Conservation Department Building
State Office Building Campus
50 Wolf Road
Albany, New York 12201
(A.C. 919-829-3391)

Executive Director
Wildlife Resources Commission
P.O. Box 2919
Raleigh, North Carolina 27602
(A.C. 919-829-3391)

Commissioner
State Game and Fish Department
2121 Lovett Avenue
Bismarck, North Dakota 58501
(A.C. 701-224-2180)

Director
Department of Natural Resources
907 Ohio Departments Building
Columbus, Ohio 43215
(A.C. 614-469-3770)

Director
Department of Wildlife Conservation
P.O. Box 53465
Oklahoma City, Oklahoma 73105
(A.C. 405-521-3851)

Director
State Game Commission
P.O. Box 3503
Portland, Oregon 97208
(A.C. 503-229-5407)

Executive Director
Fish Commission
P.O. Box 1673
Harrisburg, Pennsylvania 17120
(A.C. 717-787-6593)

Executive Director
Game Commission
P.O. Box 1567
Harrisburg, Pennsylvania 17120
(A.C. 717-787-3633)

Director
Department of Natural Resources
83 Park Street
Providence, Rhode Island 02903
(A.C. 401-277-2773)

Director
Division of Game and Freshwater Fisheries
1015 Main Street
P.O. Box 167
Columbia, South Carolina 29202
(A.C. 803-758-2561)

Director
Department of Game, Fish and Parks
State Office Building
Pierre, South Dakota 57501
(A.C. 605-224-3387)

Director
Game and Fish Commission
P.O. Box 40747
Ellington Building, Agricultural Center
Nashville, Tennessee 37220
(A.C. 615-741-1431)

Executive Director
Parks and Wildlife Department
Reagan State Building
Austin Texas 78701
(A.C. 512-475-2087)

Director
Fish and Game Division
1596 West North Temple
Salt Lake City, Utah 84116
(A.C. 801-328-5081)

Commissioner
Fish and Game Department
Montpelier, Vermont 05602
(A.C. 802-223-2311 x-477)

Executive Director
Commission of Game and Inland Fisheries
4010 West Broad Street
P.O. Box 11104
Richmond, Virginia 23230
(A.C. 703-770-4974)

Director
Department of Game
699 North Capitol Way
Olympia, Washington 98501
(A.C. 206-753-5700)

Director
Department of Natural Resources
State Office Building No. 3
Charleston, West Virginia 25305
(A.C. 304-348-2754)

Secretary
Department of Natural Resources
Box 450
Madison, Wisconsin 53701
(A.C. 608-266-2121)

Commissioner
Game and Fish Commission
Box 1589
Cheyenne, Wyoming 82001
(A.C. 307-777-7631)

Secretary
Department of Agriculture
Box 10163, Santuce
San Juan, Puerto Rico 00908
(722-2120)

Commissioner
Department of Conservation and Cultural Affairs
Charlotte Amalie
St. Thomas, Virgin Islands 00801

Governor of Guam
Agana, Guam 96910

Governor of American Samoa
Pago Pago, Tutuila
American Samoa 96920

Partial Listing by State or Territory of Endangered Wildlife in the United States.

State-Territory	Common Names
Alabama	Watercress darter
	American alligator
	* Southern bald eagle
	* Bachman's warbler
	Florida panther
Alaska	Aleutian Canada goose
	*American peregrine falcon
	*Arctic peregrine falcon
Arizona	Arizona (Apache) trout
	Humpback chub
	Colorado squawfish
	Mexican duck
	Southern bald eagle
	American peregrine falcon
	Masked bobwhite
	Yuma clapper rail
	Sonoran pronghorn antelope
Arkansas	Southern bald eagle
	American alligator
California	Lahontan cutthroat trout
	Paiute cutthroat trout
	Tecopa pupfish
	Owens pupfish
	Unarmored threespine stickleback
	Blunt-nosed leopard lizard
	San Francisco garter snake
	Santa Cruz long-toed salamander
	California brown pelican
	Aleutian Canada goose
	California condor
	Southern bald eagle

* Migratory species whose ranges are not fully given by State; refer to individual species data sheets for the Southern bald eagle, American peregrine falçon, Arctic peregrine falcon, Whooping crane, Eskimo curlew, Bachman's warbler, Kirtland's warbler and Indiana bat.

	American peregrine falcon
	Yuma clapper rail
	California clapper rail
	Light-footed clapper rail
	California least tern
	Morro Bay kangaroo rat
	Salt-Marsh harvest mouse
	San Joaquin kit fox
Colorado	Greenback cutthroat trout
	Colorado squawfish
	American peregrine falcon
	Black-footed ferret
Delaware	Southern bald eagle
Florida	Shortnose sturgeon
	Eastern brown pelican
	Florida Everglade kite
	Southern bald eagle
	Dusky seaside sparrow
	Cape Sable sparrow
	Florida panther
	Florida manatee
	Key deer
Georgia	American alligator
	Eastern brown pelican
	Southern bald eagle
	Florida panther
Great Lakes area	Longjaw cisco
	Blue pike
Hawaii	Hawaiian dark-rumped petrel (uau)
	Hawaiian goose (nene)
	Laysan duck
	Hawaiian duck (koloa)
	Hawaiian hawk (io)
	Hawaiian gallinule (alae ula)
	Hawaiian coot (alae keokeo)
	Hawaiian stilt (aeo)
	Hawaiian crow (alala)
	Small Kauai thrush (puaiohi)
	Large Kauai thrush (kauai omao)
	Molokai thrush (olomau)
	Nihoa millerbird
	Kauai oo (oo aa)
	Crested honeycreeper (akohekohe)
	Akiapolaau

	Kauai akialoa
	Kauai nukupuu
	Maui nukupuu
	Hawaii akepa (akepa)
	Maui akepa (akepuie)
	Oahu creeper (alauwahio)
	Molokai creeper (kakawahie)
	Maui parrotbill
	Ou
	Laysan finch
	Nihoa finch
	Palila
	Hawaiian hoary bat
Idaho	American peregrine falcon
Illinois	*Indiana bat
Indiana	Indiana bat
Kentucky	Indiana bat
Louisiana	American alligator
	Southern bald eagle
	American ivory-billed woodpecker
Maryland	Maryland darter
	Southern bald eagle
	Delmarva Peninsula fox squirrel
Michigan	*Kirtland's warbler
	Eastern timber wolf
Minnesota	Eastern timber wolf
Mississippi	American alligator
	Southern bald eagle
Missouri	Indiana bat
Montana	American peregrine falcon
	Black-footed ferret
Nebraska	Black-footed ferret
Nevada	Lahontan cutthroat trout
	Pahranagat bonytail
	Moapa dace
	Cui-ui
	Devil's Hole pupfish

	Warm Spring pupfish
	Pahrump killifish
	American peregrine falcon
New Jersey	Southern bald eagle
	* Eskimo curlew
New Mexico	Gila trout
	Mexican duck
	Southern bald eagle
	American peregrine falcon
New York	Shortnose sturgeon
North Carolina	American alligator
	Eastern brown pelican
	Southern bald eagle
North Dakota	Black-footed ferret
Oklahoma	American alligator
Oregon	California brown pelican
	Aleutian Canada goose
	American peregrine falcon
	Columbia white-tailed deer
South Carolina	American alligator
	Eastern brown pelican
	Southern bald eagle
	Eskimo curlew
	American ivory-billed woodpecker
	Bachman's warbler
South Dakota	Black-footed ferret
Tennessee	Southern bald eagle
Texas	Comanche Springs pupfish
	Clear Creek gambusia
	Pecos gambusia
	Fountain darter
	American alligator
	Texas blind salamander
	Houston toad
	Eastern brown pelican
	Mexican duck
	Southern bald eagle
	Attwater's prairie chicken
	* Whooping crane

	Eskimo curlew
	American ivory-billed woodpecker
	Red wolf
	Black-footed ferret
Utah	Humpback chub
	Woundfin
	Colorado squawfish
	American peregrine falcon
Virginia	Southern bald eagle
	Bachman's warbler
Washington	Aleutian Canada goose
	American peregrine falcon
	Columbian white-tailed deer
Wisconsin	Eastern timber wolf
Wyoming	Humpback chub
	Kendall Warm Springs dace
	American peregrine falcon
	Black-footed ferret
Puerto Rico	Puerto Rican boa
	Puerto Rican plain pigeon
	Puerto Rican parrot
Virgin Islands	Puerto Rican boa

The Endangered Species Conservation Act of 1969 (83 Stat 275) provides authority for the Federal Government's endangered species conservation program.

Among other things, this Act requires the Secretary of the Interior to publish in the Federal Register and periodically to modify lists of species or subspecies of vertebrates, mollusks or crustaceans he has determined to be threatened with extinction. Two such lists are maintained: The List of Endangered Foreign Fish and Wildlife, which names animals threatened with worldwide extinction; and the List of Endangered Native Fish and Wildlife, which names those threatened with extinction within the territory of the United States.

The current version of this second list is set forth below and includes all revisions thru those published in the June 4, 1973 issue of the Federal Register (Vol. 38, No. 106). Further modification will be made at irregular intervals as warranted by changes in the status of the various species or other factors. Persons who need to know the status of this list at any given time should contact the Office of Endangered Species and Internation Activities, Bureau of Sport Fisheries and Wildlife, U.S. Department of the Interior, Washington, D.C., 20240.

These pages supercede and replace pages 287 thru 289 of the Bureau of Sport Fisheries and Wildlife's Resource Publication #114, Threatened Wildlife of the United States, dated March 1973. Of the animals discussed in this publication, only those named below or those subsequently added to this list by publication of their names in the Federal Register are considered to be "endangered" as provided for by the Endangered Species Conservation Act of 1969.

Common Name	Scientific Name	Page
FISHES		
Bonytail, Pahranagat	Gila robusta jordani	30
Chub, humpback	Gila cypha	29
Chub, Mohave	Siphateles mohavensis	31
Cisco, longjaw	Coregonus alpenae	9
Cui-ui	Chasmistes cujus	39
Dace, Kendall Warm Springs	Rhinichthys osculus thermalis	36
Dace, Moapa	Moapa coriacea	33
Darter, fountain	Etheostoma fonticola	58
Darter, Maryland	Etheostoma sellare	63
*Darter, Okaloosa	Etheostoma okaloosae	61

*Added to the United States List of Endangered Native Fish and Wildlife, Federal Register, Vol. 38, No. 106--Monday, June 4, 1973.

Darter, watercress	Etheostoma nuchale	60
Gambusia, Big Bend	Gambusia gaigei	48
Gambusia, Clear Creek	Gambusia heterochir	49
Gambusia, Pecos	Gambusia nobolis	50
Killifish, Pahrump	Empetrichythys latos	47
Pike, blue	Stizostedion vitreum glaucum	66
Pupfish, Comanche Springs	Cyprinodon elegans	42
Pupfish, Devil's Hole	Cyprinodon diabolis	41
Pupfish, Owens River	Cyprinodon radiosus	46
Pupfish, Tecopa	Cyprinodon nevadensis calidae	43
Pupfish, Warm Springs	Cyprinodon nevadensis pectoralis	45
Squawfish, Colorado River	Ptychocheilus lucius	35
Stickleback, unarmored threespine	Gasterosterus aculeatus williamsoni	53
Sturgeon, shortnose	Acipenser brevirostrum	6
Topminnow, Gila	Poeciliopsis occidentalis	52
Trout, Arizona (Apache)	Salmo sp.	24
Trout, Gila	Salmo gilae	23
Trout, greenback cutthroat	Salmo clarki stomias	19
Trout, Lahontan cutthroat	Salmo clarki henshawi	16
Trout, Paiute cutthroat	Salmo clarki seleniris	18
Woundfin	Plagopherus argentissimus	34

REPTILES AND AMPHIBIANS

Alligator, American	Alligator mississippiensis	88
Boa, Puerto Rican	Epicrates inornatus	96
Lizard, blunt-nosed leopard	Crotaphytus silus	94
*Salamander, desert slender	Batrachoseps aridus	75
Salamander, Santa Cruz long-toed	Ambystoma macrodactylum croceum	74
Salamander, Texas blind	Typhlomolge rathbuni	81
Snake, San Francisco garter	Thamnophis sirtalis tetrataenia	97
Toad, Houston	Bufo houstonensis	85

BIRDS

Akepa, Hawaii (akepa)	Loxops coccinea coccinea	184
Akepa, Maui (akepuie)	Loxops coccinea ochraceu	185
Akialoa, Kauai	Hemignathus procerus	179
Akiapolaau	Hemignathus wilsoni	183
Bobwhite, masked	Colinus virginianus ridgwayi	136
Condor, California	Gymnogyps californianus	118
Coot, Hawaiian	Fulica americana alai	148
*Crane, Mississippi sandhill	Grus canadensis pulla	141

*Added to the United States List of Endangered Native Fish and Wildlife, Federal Register, Vol. 38, No. 106--Monday, June 4, 1973.

Crane, whooping	Grus americana	138
Crow, Hawaiian (alala)	Corvus tropicus	166
Creeper, Molakai (kakawahie)	Loxops maculata flammea	187
Creeper, Oahu (alauwahio)	Loxops maculata maculata	186
Curlew, Eskimo	Numenius borealis	149
Duck, Hawaiian (koloa)	Anas wyvilliana	114
Duck, Laysan	Anas laysanensis	113
Duck, Mexican	Anas diazi	116
Eagle, Southern bald	Haliaeetus leucocephalus leucocephalus	124
Falcon, American peregrine	Falco peregrinus anatum	127
Falcon, Arctic peregrine	Falco peregrinus tundrius	129
Finches, Laysan and Nihoa	Psittirostra cantans	190,191
Gallinule, Hawaiian	Gallinula chloropus sandvicensis	147
Goose, Aleutian Canada	Branta canadensis leucopareia	109
Goose, Hawaiian (nene)	Branta sandvicensis	108
Hawk, Hawaiian (io)	Buteo solitarius	123
Kite, Florida Everglade (snail kite)	Rostrhamus sociabilis plumbeus	120
Honeycreeper, crested (akohekohe)	Palmeria dolei	178
Millerbird, Nihoa	Acrocephalus kingi	171
Nukupuus, Kauai and Maui	Hemignathus lucidus	180,181
Oo, Kauai (oo aa)	Moho braccatus	172
Ou	Psittirostra psittacea	189
Palila	Psittirostra bailleui	192
Parrot, Puerto Rican	Amazona vittata	156
Parrotbill, Maui	Pseudonestor xanthorphrys	188
Pelican, brown	Pelecanus occidentalis	102,104
Petrel, Hawaiian dark-rumped	Pterodroma phaeopygia sandwichensis	101
Pigeon, Puerto Rican plain	Columba inornata wetmorei	155
Prairie Chicken, Attwater's greater	Tympanuchus cupido attwateri	133
Rail, California clapper	Rallus longirostris obsoletus	142
Rail, light-footed clapper	Rallus longirostris levipes	144
Rail, Yuma clapper	Rallus longirostris yumanensis	145
Sparrow, Cape Sable	Ammospiza mirabilis	197
Sparrow, dusky seaside	Ammospiza nigrescens	195
*Sparrow, Santa Barbara song	Melospiza melodia graminea	---
Stilt, Hawaiian	Himantopus himantopus knudseni	151
Tern, California least	Sterna albifrons browni	153
Thrush, large Kauai	Phaeornis obscurus myadestina	168
Thrush, Molokai (olomau)	Phaeornis obscurus rutha	170
Thrush, small Kauai (puaiohi)	Phaeornis palmeri	167
Warbler, Bachman's	Vermivora bachmanii	173
Warbler, Kirtland's	Dendroica kirtlandii	175
*Whip-poor-will, Puerto Rican	Caprimulgus noctitherus	161
Woodpecker, ivory-billed	Campephilus principalis	164
Woodpecker, red-cockaded	Dendrocopus borealis	162

*Added to the United States List of Endangered Native Fish and Wildlife, Federal Register, Vol. 38, No. 106--Monday, June 4, 1973.

MAMMALS

Bat, Hawaiian hoary	Lasiurus cinereus semotus	214
Bat, Indiana	Myotis sodalis	209
*Cougar, Eastern	Felis concolor cougar	253
Deer, Columbian white-tailed	Odocoileus virginianus leucurus	266
Deer, Key	Odocoileus virginianus clavium	265
Ferret, black-footed	Mustela nigripes	247
Fox, San Joaquin kit	Vulpes macrotis mutica	243
Manatee, Florida (sea cow)	Trichechus manatus latirostris	261
Mouse, salt marsh harvest	Reithrodontomys raviventris	226
Panther, Florida	Felis concolor coryi	251
*Prairie Dog, Utah	Cynomys parvidens	217
Pronghorn, Sonoran	Antilocapra americana sonoriensis	267
Rat, Morro Bay kangaroo	Dipodomys heermanni morroensis	224
Squirrel, Delmarva Peninsula fox	Sciurus niger cinereus	220
Wolf, Eastern timber	Canis lupus lycaon	237
*Wolf, Northern Rocky Mountain	Canis lupus irremotus	235
Wolf, red	Canis rufus	241

*Added to the United States List of Endangered Native Fish and Wildlife, Federal Register, Vol. 38, No. 106--Monday, June 4, 1973.

Created in 1849, the Department of the Interior is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States--now and in the future.

INT: 745-73

Kirtland's warbler	Dendroica kirtlandii
Dusky seaside sparrow	Ammospiza nigrescens
Cape Sable sparrow	Ammospiza mirabilis

MAMMALS

Hawaiian hoary bat	Lasiurus cinereus semotus
Indiana bat	Myotis sodalis
Delmarva Peninsula fox squirrel	Sciurus niger cinereus
Morro Bay kangaroo rat	Dipodomys heermanni morroensis
Salt marsh harvest mouse	Reithrodontomys raviventris
Eastern timber wolf	Canis lupus lycaon
Red wolf	Canis rufus
San Joaquin kit fox	Vulpes macrotis mutica
Black-footed ferret	Mustela nigripes
Florida panther	Felis concolor coryi
Florida manatee (sea cow)	Trichechus manatus latirostris
Key deer	Odocoileus virginianus clavium
Columbian white-tailed deer	Odocoileus virginianus leucurus
Sonoran pronghorn	Antilocapra americana sonoriensis

Created in 1849, the Department of the Interior is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States--now and in the future.